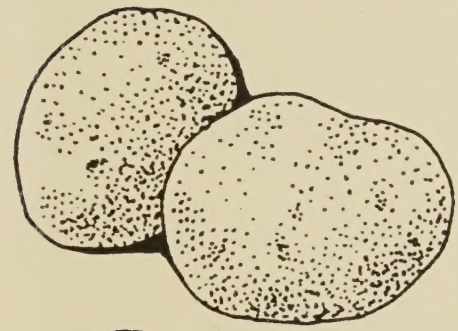
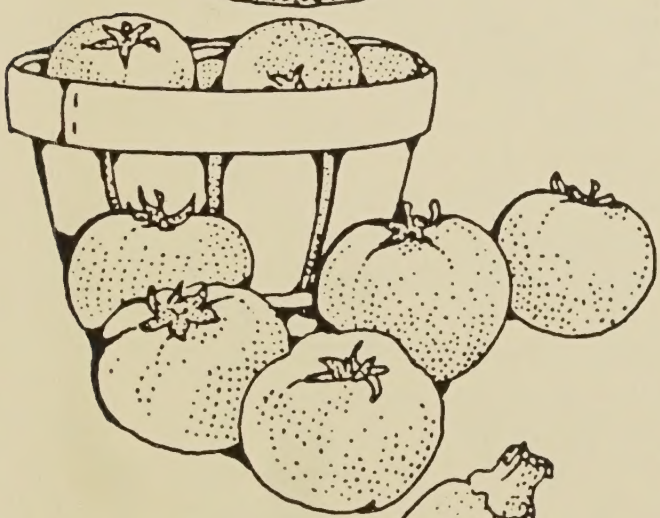
Pesticide Use Surveys Missouri, 1992

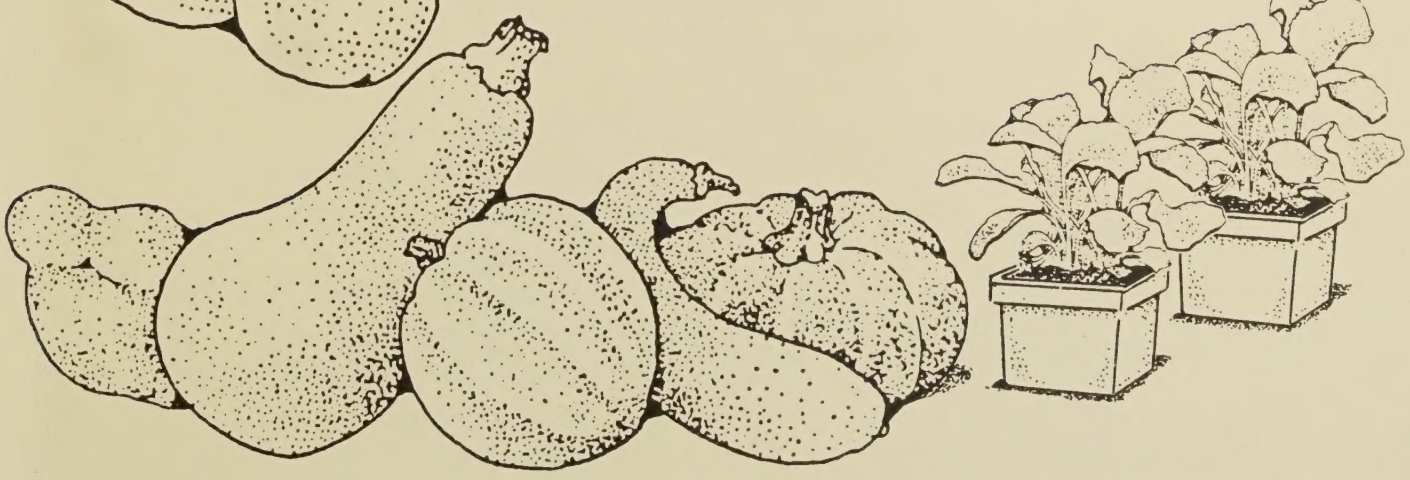
S. Anastasia Becker
George S. Smith
Maureen O'Day
Jim Jarman



I. Vegetables:
Fresh Market Beans,
Cucurbits, Potatoes,
and Tomatoes

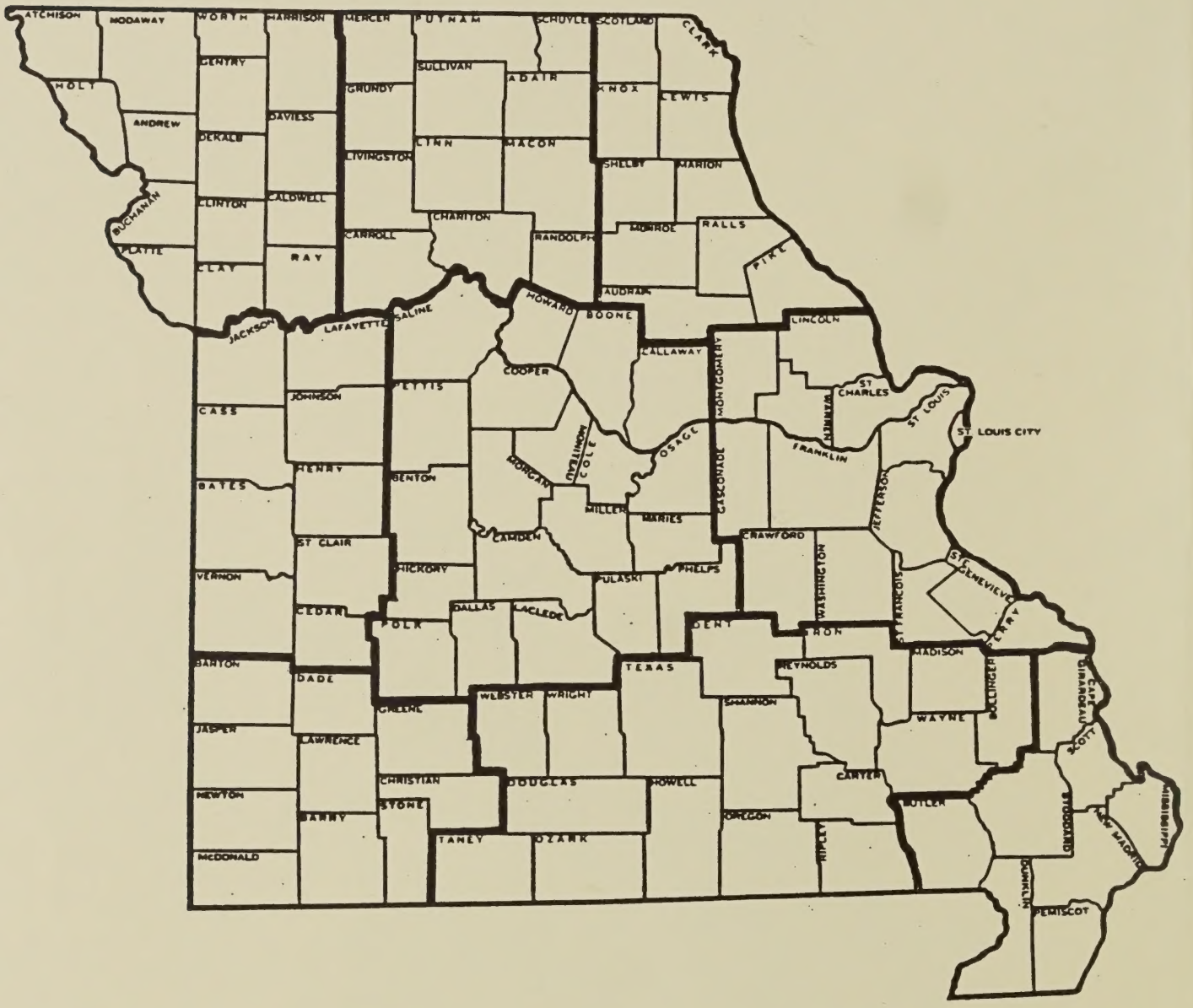
II. Nursery Crops





Pesticide Impact Assessment Program
USDA ES 91-EPIX-1-0018 6/92

Map 1. Missouri crop reporting districts as defined by Missouri Agricultural Statistics Service.



Crop Reporting Districts

1 = Northwest
2 = North central
3 = Northeast
4 = West central
5 = Central
6 = East central
7 = Southwest
8 = South central
9 = Southeast

Table of Contents

Major Vegetable Pests

Nursery Crops

Appendix

Summary

Pesticide use surveys on four vegetable crops (fresh market beans, cucurbits, potatoes, and tomatoes) and nursery crops were conducted with phone and mail-in responses to a questionnaire. The following information for each commodity was collected for the 1992 production season: (1) percentage of acreage treated with a fungicide, herbicide, insecticide, fumigant or growth regulator; (2) pounds of active ingredient of each pesticide applied to treated acres; (3) number of applications per acre of fungicides, herbicides, insecticides, fumigants, and growth regulators; and (4) primary diseases, insects, and weeds reported to cause economic loss to each crop. Statewide pesticide use estimates were extrapolated from survey responses.

Combined vegetable acreage in Missouri was treated with a total of 40,327 pounds of fungicide active ingredients, 24,941 pounds of herbicide active ingredients, 10,070 pounds of insecticide active ingredients, and 67 pounds of fumigant active ingredients (Tables 15,16). The fungicide, mancozeb, accounted for 58% of the total pounds of fungicide active ingredients; 95% of the mancozeb was applied to potatoes (Tables 11,15). The herbicides, naptalam and metolachlor, applied to cucurbits and potatoes, respectively, accounted for 65% of the total pounds of herbicide active ingredients (Tables 9,11,15). The insecticide, carbaryl, accounted for 59% of the total pounds of insecticide active ingredients (Table 16) and was also the most commonly used insecticide on vegetables.

A total of 28.5 acres of fresh market beans were surveyed for pesticide use which represents 3.6% of the estimated 800 acres of beans grown in Missouri in 1992. Statewide, fungicides were applied to 37 acres (4.6%), herbicides to 157 acres (19.6%), and insecticides to 286 acres (35.8%) (Table 1). Fresh market bean acreage in Missouri was treated with a total of 214 pounds of fungicide, 213 pounds of herbicide, and 577 pounds of insecticide active ingredients applied statewide (Table 6). Based upon pounds of active ingredients, the greatest amount of fungicide, herbicide, and insecticide products applied were captan (93%), DCPA (58%), and carbaryl (82%), respectively (Table 6). The disease reported to cause the greatest economic loss to fresh market beans was

rust, the insect was spotted cucumber beetle, and the weed class was annual grasses (Fig. 1,2,9).

A total of 7200 acres of cucurbit crops were surveyed for pesticide use which represents 56% of the estimated 12,800 acres of cucurbits grown in Missouri in 1992. Statewide, fungicides were applied to 5862 acres (45.8%), herbicides to 6093 acres (47.6%), and insecticides to 8077 acres (63.1%) (Table 2). Cucurbit crop acreages in Missouri were treated with a total of 12,637 pounds of fungicide, 12,524 pounds of herbicide, 6856 pounds of insecticide, and 67 pounds of fumigant active ingredients applied statewide (Table 9). Based upon pounds of active ingredients, the greatest amount of fungicide, herbicide, and insecticide products applied were chlorothalonil (61%), naptalam (68%), and carbaryl (72%), respectively (Table 9). Diseases reported to cause the greatest economic loss to cucurbit crops were downy & powdery mildew, the insects were cucumber beetles, and the weed class was broadleaf annuals (Fig. 3,4,9).

A total of 6883 acres of potatoes were surveyed for pesticide use which represents 89% of the 7700 harvested acres reported by Missouri Agricultural Statistics Service. Statewide, fungicides were applied to 7692 acres (99.9%), herbicides to 7677 acres (99.7%), and insecticides to 7662 acres (99.5%) (Table 3). Potato acreage in Missouri was treated with a total of 26,536 pounds of fungicide, 12,078 pounds of herbicide, and 2158 pounds of insecticide active ingredients applied statewide (Table 11). Based upon pounds of active ingredients, the greatest amount of fungicide, herbicide, and insecticide products applied were mancozeb (84%), metolachlor (65%), and carbofuran (36%), respectively (Table 11). The disease category reported to cause the greatest economic loss to potatoes was tuber diseases, the insect was Colorado potato beetle, and the weed class was annual grasses (Fig. 5,6,9).

A total of 82.2 acres of tomatoes were surveyed for pesticide use which represents 21% of the estimated 400 grown in Missouri in 1992. Statewide, fungicides were applied to 177 acres (44.2%), herbicides to 143 acres (35.8%), and insecticides to 279 acres (69.7%) (Table 4). Tomato acreage in Missouri was treated with a total of 940 pounds of fungicide, 126 pounds of herbicide, and 481 pounds of insecticide active ingredients applied statewide (Table 14). Based upon pounds of active ingredients, the greatest amount of fungicide, herbicide, and insecticide products applied were mancozeb (40%),

trifluralin (69%), and carbaryl (75%), respectively (Table 14). The disease complex reported to cause the greatest economic loss to tomatoes was leaf spots & blights, the insects were the tomato hornworm and tomato fruitworm, and the weed class was annual grasses (Fig. 7-9).

A total of 1484 acres of nursery crops were surveyed for pesticide use which represents 13% of the estimated 11,250 acres in production in Missouri in 1992. Statewide, fungicides were applied to 5974 acres (53.1%), herbicides to 6086 acres (54.1%), and insecticides to 6323 acres (56.2%) (Table 17). The most commonly applied fungicide, herbicide, and insecticide and the percentage of nursery acres treated, respectively, were chlorothalonil (44%), oryzalin (22%), and carbaryl (21%) (Tables 18-20). The disease category reported to cause the greatest economic loss was rusts & mildews, the insects were aphids, and the weed class was grass (Fig. 10-12).

Nursery producers were asked additional questions regarding the use of alternative control measures if pesticides they currently use were to be canceled. The majority of respondents indicated they would choose another pesticide and they estimated that their choice of alternatives would simultaneously decrease plant production and increase production costs by less than 10% (Fig. 13-18).

Survey Methods

Surveys were sent to producers of nursery crops and four targeted vegetable crops. The producers were identified by the Missouri Agricultural Statistics Service (MASS). Surveys were mailed in October 1992, followed by a reminder card in 2 weeks, and a second mailing of the same survey form 2 weeks later. Nonrespondents were telephoned in November by phone enumerators from MASS. To ensure anonymity, surveys were coded with only the respondent's county, crop reporting district (Map 1), and sequence number. Sample survey forms are included in the appendix.

The information collected from the vegetable and nursery surveys included:

1) Acreage of vegetables or nursery crops.
2) Average yield per acre for vegetable crops; average number of plants per acre for nursery crops.

3) Acreage treated at least once with a fungicide, herbicide, insecticide, fumigant, or growth regulator.
4) Products and rates used on crops.
5) Number of applications of each pesticide on various crops.
6) Major disease, insect, and weed pests causing economic losses to crops.
7) Alternative control strategies for nursery crops if the pesticides used currently were to be canceled and the estimated changes in production output and costs.

Information extrapolated from survey results to estimate statewide pesticide use included survey **acres treated** with each pesticide and pounds of active ingredients applied on **treated acres**. Acres that had at least one application of a pesticide were considered to be **acres treated**. **Acres treated** multiplied by the number of applications for each product were labeled as **treated acres**.

Banded applications of a pesticide was counted as one-third of the acreage treated unless more specific information was available. Spot spraying of a pesticide was counted as one-tenth of the acreage treated with the particular compound.

Not all sections were completed on the surveys received. Some respondents listed acreage as being treated with one or more pesticides but did not specify which pesticide. These acres were labeled as "not indicated".

Some respondents listed their compounds and acreage but did not give the rates they used. Missing rates for pesticide applications were assumed to be the mean rate calculated from survey data from other respondents.

Mean rate calculation

Σ (acres treated X number of applications X rate) = APA (amount product applied)

Mean rate product applied per acre = APA / Σ (acres treated X number of applications)

Unfortunately, few nursery surveys included adequate data to calculate pounds of active ingredients. Many responses were "label rate" without specifying the crop treated, target pest, or specific product formulation used. Therefore, pesticide use tables for

nursery crops include only the treated acres, products used, and mean number of applications of the pesticides.

Estimated Missouri acreages in production for targeted vegetable and nursery crops were obtained from MASS and Extension Horticulture Specialists from the University of Missouri and Lincoln University. For nursery crops, the 1991 acreage of salable plants inspected and certified by Missouri Department of Agriculture was multiplied by a factor of 5 to arrive at an approximation of total acres in production (Dr. Chris Starbuck, personal communication). This calculation for acreage treated with pesticides included plants not mature enough for sale yet still receiving pesticide applications. Acreage in sod production was excluded since Missouri Plant Law does not consider sod to be nursery stock unless grown for the purpose of propagation.

We thank the following people for their assistance with this project: Paul Walsh, Marlowe Schlegel, Nathan Crisp, and Dave Emslie of MASS; Dr. Chris Starbuck, University of Missouri State Extension Horticulture Specialist; Dr. Victor Lambeth, University of Missouri Professor Emeritus of Horticulture; and Dr. David Sasseville, Lincoln University Extension Horticulture Specialist.

Fresh Market Beans

Fifty-four producers of fresh market beans, with 28.5 acres in production, responded to the survey. This represents 3.6% of the estimated 800 acres of fresh beans grown in Missouri in 1992. Fungicides were applied on 4.6%, herbicides on 19.6%, and insecticides on 35.8% of the surveyed acreage (Table 1). Acreage treated with pesticides received an average of 2.4 applications of fungicides, 1.0 application of herbicides, and 2.8 applications of insecticides (Table 5).

An estimated 214 pounds of fungicide active ingredients were applied to the state fresh market bean acreage (Table 6). Captan was applied to 70% of these acres and accounted for 93% of the total pounds of fungicide active ingredients (Tables 5,6).

An estimated 213 pounds of herbicide active ingredients were applied to state fresh market bean acreage (Table 6). Trifluralin was applied to 56% of the acreage and accounted for 32% of the total pounds of herbicide active ingredients; however, DCPA accounted for 58% of the total pounds of herbicide active ingredients applied throughout the state (Tables 5,6).

An estimated 577 pounds of insecticide active ingredients were applied to state fresh market bean acreage (Table 6). Carbaryl was applied to 62% of the treated acres and accounted for 82% of the total pounds of insecticide active ingredients applied throughout the state (Tables 5,6).

Diseases reported to cause the greatest economic losses were rust (12.3%) and white mold (8.8%), although 64.9% of the respondents reported no disease problems (Fig. 1). The insect reported to cause the greatest economic loss was the spotted cucumber beetle with 25.7% of responses (Fig. 2). The weed classes reported to cause the greatest economic losses were annual grasses (35.8%) and broadleaf annuals (31.3%) (Fig. 9).

Cucurbits

A total of 173 producers of cucurbit crops (cucumbers, melons, pumpkins, and squash), with 7200 acres in production, responded to the survey. This represents 56% of the estimated 12,800 acres of cucurbit crops grown in Missouri in 1992. The main production regions were located in the southwest and southeast crop reporting districts (Map 1). Fungicides were applied on 45.8%, herbicides on 47.6%, and insecticides on 63.1% of the surveyed acreage (Table 2). Acreage treated with pesticides received an average of 2.3 applications of fungicides, 1.1 applications of herbicides, 1.8 applications of insecticides, and 1.0 application of fumigants (Tables 7,8). Several growers in the west central and southwest districts noted that their chemical usage was below normal due to excessive rain and being unable to access their fields.

An estimated 12,637 pounds of fungicide active ingredients were applied to the state cucurbit acreage (Table 9). Benomyl was applied to 39% of these acres and accounted for 12% of the total pounds of fungicide active ingredients; however, chlorothalonil accounted for 61% of the total pounds of fungicide active ingredients applied throughout the state (Tables 7,9).

An estimated 12,524 pounds of herbicide active ingredients were applied to the state cucurbit acreage (Table 9). Naptalam was applied to 46% of the treated acres and accounted for 68% of the total pounds of herbicide active ingredients (Tables 7,9).

An estimated 6856 pounds of insecticide active ingredients were applied to state cucurbit acreage (Table 9). Carbaryl was applied to 39% of the treated acres and accounted for 72% of the total pounds of insecticide active ingredients (Tables 8,9). It should be noted that the survey forms itemized carbofuran as being applied either for nematode or insect control. Respondents used carbofuran to control insects and nematodes on 89% and 11%, respectively, of the 5434 treated acres (Table 8).

The disease category reported to cause the greatest economic loss was downy and powdery mildew (18%) (Fig. 3). The insects reported to cause the greatest economic loss were cucumber beetles (43.6%) (Fig. 4). Numerous insects were listed in the "other" category, but only blister beetle was mentioned more than once. Weed class reported to cause the greatest economic damage was broadleaf annuals (42.7%) (Fig. 9).

Potatoes

A total of 18 potato producers, with 6883 acres in production, responded to the survey. This represents 89% of the 7700 harvested acres reported by MASS. The southeast crop reporting district is Missouri's principal potato growing region (Table 3, Map 1). This district had 7 respondents who reported 86% of the survey acreage (Table 3). Fungicides were applied on 99.9%, herbicides on 99.7%, and insecticides on 99.5% of the surveyed acreage (Table 3). Acreage treated with pesticides received an average of 2.5 applications of fungicides, 1.0 application of herbicides, 1.3 applications of insecticides (Table 10).

An estimated 26,536 pounds of fungicide active ingredients were applied to the state potato acreage (Table 11). Mancozeb was applied to 78% of these acres and accounted for 84% of the total pounds of fungicide active ingredients (Tables 10,11).

An estimated 12,078 pounds of herbicide active ingredients were applied to state potato acreage (Table 11). Metribuzin was applied to 42% of the acreage and accounted for 20% of the total pounds of herbicide active ingredients; however, metolachlor accounted for 65% of the total pounds of herbicide active ingredients applied throughout the state (Tables 10,11).

An estimated 2158 pounds of insecticide active ingredients were applied to state potato acreage (Table 11). Phorate was applied to 27% of the treated acres and accounted for 30% of the total pounds of insecticide active ingredients; however, carbofuran accounted for 36% of the total pounds of insecticide active ingredients (Tables 10,11).

Diseases reported to cause the greatest economic loss were tuber diseases (20%) (Fig. 5). However, 36% of the respondents reported no disease problems. The insect reported to cause the greatest economic loss was the Colorado potato beetle (29.6%) (Fig. 6). The weed classes reported to cause the greatest economic loss were annual grasses (36.8%) and broadleaf annuals (31.6%) (Fig. 9).

Tomatoes

A total of 92 tomato producers, with 82.2 acres in production, responded to the survey. This represents 21% of the estimated 400 acres of tomatoes grown in Missouri in 1992. The east central and southeast crop districts reported the greatest number of acres in production (Table 4, Map 1).

Fungicides were applied on 44.2%, herbicides on 35.8%, and insecticides on 69.7% of the treated acres (Table 4). Acreage treated with pesticides received an average of 2.8 applications of fungicides, 1.0 application of herbicides, and 2.9 applications of insecticides (Tables 12,13).

An estimated 940 pounds of fungicide active ingredients were applied to the state tomato acreage (Table 14). Chlorothalonil was applied to 32% of the acreage and accounted for 39% of the total fungicide active ingredients (Tables 12,14). Mancozeb, the second most commonly applied fungicide, was applied to 30% of the acreage and accounted for 40% of the total fungicide active ingredients (Tables 12,14).

An estimated 126 pounds of herbicide active ingredients were applied to state tomato acreage (Table 14). Trifluralin was applied to 48% of the total herbicide treated acres and accounted for 69% of the active ingredients (Tables 12,14).

An estimated 481 pounds of insecticide active ingredients were applied to state tomato acreage (Table 14). Carbaryl was applied to 35% of the treated acres and accounted for 75% of the total insecticide active ingredients (Tables 13,14).

The disease complex reported to cause the greatest economic loss was leaf spots & blights (35%) (Fig. 7). The insects reported to cause the greatest economic losses were tomato fruitworm and tomato hornworm (14.3% each) (Fig. 8). Numerous respondents listed stink bugs, grasshoppers, and blister beetles as being major insect pests which were included under "other". The weed classes reported to cause the greatest economic losses were annual grasses (32.6%) and broadleaf annuals (25.0%) (Fig. 9).

Fresh Market Beans

Table 1. Survey acres of fresh market beans treated with insecticides, herbicides, and fungicides in Missouri, 1992.

Crop Reporting District	Number of Respondents	Survey Acres	Percentage of Acres Treated		
			Insecticide	Herbicide	Fungicide
Northwest	9	3.7	95%	49%	3%
North Central	4	0.8	75%	0%	62%
Northeast	1	0.2	0%	0%	0%
West Central	9	4.3	53%	12%	0%
Central	9	4.5	16%	13%	0%
East Central	11	4.7	17%	9%	0%
Southwest	5	6.2	10%	3%	10%
South Central	3	0.5	40%	0%	0%
Southeast	3	3.5	43%	57%	0%
Survey Totals:	54	28.5			
Percent of Total Acres Treated:			35.8%	19.6%	4.6%

Cucurbits

Table 2. Survey acres of cucurbits (cucumbers, melons, pumpkins, and squash) treated with insecticides, herbicides, and fungicides in Missouri, 1992.

Crop Reporting District	Number of Respondents	Survey Acres	Percentage of Acres Treated		
			Insecticide	Herbicide	Fungicide
Northwest	19	202	81%	52%	67%
North Central	14	55	85%	55%	85%
Northeast	3	10	97%	49%	19%
West Central	12	53	67%	3%	51%
Central	18	37	77%	47%	39%
East Central	29	150	62%	34%	32%
Southwest	16	3865	55%	39%	18%
South Central	7	165	85%	79%	99%
Southeast	55	2662	72%	59%	82%
Survey Totals:	173	7200			
Percent of Total Acres Treated:			63.1%	47.6%	45.8%

Potatoes

Table 3. Survey acres of potatoes treated with insecticides, herbicides, and fungicides in Missouri counties, 1992.

Crop Reporting District & County	Number of Respondents	Survey Acres	Percentage of Acres Treated		
			Insecticide	Herbicide	Fungicide
NW Atchison	5	762	96%	98%	100%
NW Harrison	1	4	100%	100%	0%
WC Jackson	1	165	100%	100%	100%
SE Mississippi	6	5451	100%	100%	100%
SE Scott	1	500	100%	100%	100%
All Others[b]	4	1	60%	0%	0%
Survey Totals:	18	6883			
Percent of Total Acres Treated:			99.5%	99.7%	99.9%

[a] Crop reporting districts: NW=Northwest, WC=West central, SE=Southeast.
[b] Producers with less than 4 acres in production.

Tomatoes

Table 4. Survey acres of tomatoes treated with insecticides, herbicides, and fungicides in Missouri, 1992.

Crop Reporting District	Number of Respondents	Survey Acres	Percentage of Acres Treated		
			Insecticide	Herbicide	Fungicide
Northwest	12	8.8	80%	45%	14%
North Central	6	2.2	73%	45%	73%
Northeast	1	0.2	0%	0%	0%
West Central	10	6.8	29%	3%	15%
Central	16	5.3	74%	34%	57%
East Central	27	31.7	64%	32%	38%
Southwest	9	7.0	79%	1%	60%
South Central	3	0.4	0%	0%	0%
Southeast	8	19.8	85%	61%	67%
Survey Totals:	92	82.2			
Percent of Total Acres Treated:			69.7%	35.8%	44.2%

Fresh Market Beans

Table 5. Fungicides, herbicides, and insecticides applied on survey and state treated acres of fresh market beans in Missouri, 1992.

Product	Active Ingredient	Treated Acres: Survey	State
Fungicides:			
Captan	captan	1.5	42
Bravo 500	chlorothalonil	0.5	14
Benlate 50WP	benomyl	0.1	3
Not indicated	----	0.03	1
	Total Fungicide Treated Acres		**60**
	Total Bean Acres Treated		**25**
	Mean Fungicide Treatments/Acre		**2.4**
Herbicides:			
Treflan EC, MTF	trifluralin	2.7	76
Basagran	bentazon	1.0	28
Dacthal W-75	DCPA	0.8	22
Treflan TR-10	trifluralin	0.4	11
Not indicated	----	0.6	17
	Total Herbicide Treated Acres		**154**
	Total Bean Acres Treated		**154**
	Mean Herbicide Treatments/Acre		**1.0**
Insecticides:			
Sevin 50W	carbaryl	9.0	253
Sevin XLR Plus	carbaryl	6.6	185
Dipel 2X	*Bacillus thuringiensis* var. *kurstaki*	3.0	84
Lannate L	methomyl	3.0	84
Sevin 80S	carbaryl	1.6	45
Sevin 4F	carbaryl	1.5	42
Malathion 57% EL, 5EC	malathion	1.5	42
Orthene 75S	acephate	1.0	28
Phosdrin 4EC	mevinphos	1.0	28
Not indicated	----	1.8	51
	Total Insecticide Treated Acres		**842**
	Total Bean Acres Treated		**303**
	Mean Insecticide Treatments/Acre		**2.8**

Fresh Market Beans

Table 6. Pounds of fungicide, herbicide, and insecticide active ingredients applied to estimated state acres of fresh market beans in Missouri, 1992.

	Active Ingredient	Lbs. Applied to Estimated State Acres
Fungicides:	captan	198
	chlorothalonil	15
	benomyl	1
	Total pounds fungicide active ingredients:	**214**
Herbicides:	DCPA	124
	trifluralin	68
	bentazon	21
	Total pounds herbicide active ingredients:	**213**
Insecticides:	carbaryl	473
	malathion	40
	methomyl	38
	acephate	17
	Bacillus thuringiensis var. *kurstaki*	5
	mevinphos	3
	Total pounds insecticide active ingredients:	**577**

Cucurbits

Table 7. Fungicides and herbicides applied on survey and state treated acres of cucurbits (cucumbers, pumpkins, melons, and squash) in Missouri, 1992.

Product	Active Ingredient	Treated Acres: Survey	State
Fungicides:			
Benlate 50WP	benomyl	4459	7935
Bravo 720 (6F)	chlorothalonil	2351	4184
Bravo 500	chlorothalonil	968	1723
Ridomil 2E	metalaxyl	708	1260
Topsin M 70WP	thiophanate-methyl	575	1023
Dithane	mancozeb	526	936
Topsin M 85WDG	thiophanate-methyl	514	915
Bayleton 50DF	triadimefon	122	216
Kocide 101 (50WP)	copper hydroxide	100	177
Bravo W-75	chlorothalonil	91	161
Captan	captan	45	80
Champion 50WP	copper hydroxide	16	28
Ridomil/Bravo 81W	metalaxyl + chlorothalonil	10	18
Bravo 90DG	chlorothalonil	1	2
Not indicated	----	990	1762
	Total Fungicide Treated Acres		**20,420**
	Total Cucurbit Acres Treated		**8,699**
	Mean Fungicide Treatments/Acre		**2.3**
Herbicides:			
Alanap-L	naptalam	2284	4064
Treflan EC, MTF	trifluralin	1011	1800
Poast	sethoxydim	884	1573
Prefar 4E	bensulide	217	387
Treflan 5	trifluralin	109	194
Sonalan	ethalfluralin	85	151
Command 4EC	clomazone	53	94
Ramrod 4L	propachlor	50	89
Dacthal W-75	DCPA	44	79
Roundup	glyphosate	21	37
Treflan TR-10	trifluralin	20	36
Treflan 80DC	trifluralin	15	27
Not indicated	----	212	376
	Total Herbicide Treated Acres		**8907**
	Total Cucurbit Acres Treated		**8406**
	Mean Herbicide Treatments/Acre		**1.1**

Cucurbits

Table 8. Insecticides and fumigants applied on survey and state treated acres of cucurbits (cucumbers, pumpkins, melons, and squash) in Missouri, 1992.

Product	Active Ingredient	Treated Acres: Survey	State
Insecticides:			
Furadan 15G	carbofuran	3058	5434
Sevin 80S	carbaryl	1913	3399
Sevin 50W	carbaryl	1318	2341
Pounce 3.2EC	permethrin	1295	2302
Asana XL	esfenvalerate	776	1379
Sevin XLR Plus	carbaryl	413	734
Ambush 2E	permethrin	190	338
Pounce 25WP	permethrin	137	243
Guthion 35%WP	azinphos-methyl	81	144
Sevin 4F	carbaryl	62	111
Cygon 400	dimethoate	50	89
Orthene 75S	acephate	45	80
Lannate L	methomyl	38	68
Methoxychlor 4L	methoxychlor	33	59
Diazinon AG500	diazinon	23	41
Dipel 2X	*Bacillus thuringiensis* var. *kurstaki*	18	32
Malathion 57%EL, EC	malathion	15	26
Pydrin	fenvalerate	12	21
Diazinon 50WP	diazinon	7	12
Methyl Parathion	methyl parathion	7	12
Phosdrin 4EC	mevinphos	6	11
Ambush 25W	permethrin	2	3
Lannate 90	methomyl	<1	1
Not indicated	----	57	101
	Total Insecticide Treated Acres		**16,981**
	Total Cucurbit Acres Treated		**9,543**
	Mean Insecticide Treatments/Acre		**1.8**
Fumigants:			
Telone II	dichloropropene	20	36
	Total Fumigant Treated Acres		**36**
	Total Cucurbit Acres Treated		**36**
	Mean Fumigant Treatments/Acre		**1.0**

Cucurbits

Table 9. Pounds of fungicide, herbicide, insecticide, and fumigant active ingredients applied to estimated state acres of cucurbits in Missouri, 1992.

	Active Ingredient	Lbs. Applied to State Acres
Fungicides:	chlorothalonil	7665
	metalaxyl	1802
	benomyl	1543
	mancozeb	749
	thiophanate-methyl	455
	copper hydroxide	213
	captan	188
	triadimefon	22
	Total pounds fungicide active ingredients:	**12,637**
Herbicides:	naptalam	8507
	bensulide	1281
	trifluralin	1180
	DCPA	589
	propachlor	400
	sethoxydim	345
	ethalfluralin	115
	clomazone	60
	glyphosate	47
	Total pounds herbicide active ingredients:	**12,524**
Insecticides:	carbaryl	4945
	carbofuran	737
	permethrin	350
	Bacillus thuringiensis var. *kurstaki*	205
	acephate	180
	methoxychlor	176
	azinphos-methyl	56
	esfenvalerate	48
	dimethoate	44
	methomyl	39
	diazinon	40
	malathion	28
	other insecticides[a]	8
	Total pounds insecticide active ingredients:	**6856**
Fumigants:	dichloropropene	67
	Total pounds fumigant active ingredient:	**67**

[a] Methyl parathion, mevinphos, and fenvalerate.

Potatoes

Table 10. Fungicides, herbicides, and insecticides applied on survey and state treated acres of potatoes in Missouri, 1992.

Product		Active Ingredient	Treated Acres: Survey	State
Fungicides:	Penncozeb	mancozeb	7705	8617
	Bravo 720 (6F)	chlorothalonil	4840	5413
	Dithane DF	mancozeb	4784	5350
	Dithane M-45 (80WP)	mancozeb	4070	4552
	Manzate 200 DF	mancozeb	1720	1924
	Bravo 500	chlorothalonil	500	559
	Dithane F-45	mancozeb	192	215
		Total Fungicide Treated Acres:		**26,630**
		Total Potato Acres Treated:		**10,550**
		Mean Fungicide Treatments/Acre:		**2.5**
Herbicides:	Dual 8E	metolachlor	4147	4638
	Sencor DF	metribuzin	3972	4442
	Prowl	pendimethalin	1456	1628
	Sencor 4	metribuzin	1456	1628
	Assure II EC	quizalofop-P-ethyl	1000	1118
	Turbo 8EC	metolachlor + metribuzin	620	693
	Prowl 3.3EC	pendimethalin	600	671
	Lexone 4L	metribuzin	500	559
	Poast	sethoxydim	400	447
	Roundup	glyphosate	200	224
	Lorox DF	linuron	4	5
		Total Herbicide Treated Acres:		**16,053**
		Total Potato Acres Treated:		**15,500**
		Mean Herbicide Treatments/Acre:		**1.0**
Insecticides:	Thimet 15G	phorate	2800	3133
	Asana XL	esfenvalerate	2412	2698
	Pounce 3.2EC	permethrin	2248	2515
	Furadan 4F	carbofuran	1223	1368
	Pydrin	fenvalerate	600	671
	Pounce WSB	permethrin	400	448
	Thimet 20G	phorate	244	273
	Sevin 4F	carbaryl	240	268
	Di-Syston 15G	disulfoton	165	185
	Monitor 4 Spray	methamidophos	100	112
	Sevin 80S	carbaryl	1	1
		Total Insecticide Treated Acres:		**11,672**
		Total Potato Acres Treated:		**9,147**
		Mean Insecticide Treatments/Acre:		**1.3**

Potatoes

Table 11. Pounds of fungicide, herbicide, and insecticide active ingredients applied to estimated state acres of potatoes in Missouri, 1992.

Active Ingredient		Lbs. Applied to Estimated State Acres
Fungicides:	mancozeb	22,299
	chlorothalonil	4,237
	Total pounds fungicide active ingredients:	**26,536**
Herbicides:	metolachlor	7804
	metribuzin	2466
	pendimethalin	1375
	glyphosate	335
	quizalofop-P-ethyl	49
	sethoxydim	42
	linuron	7
	Total pounds herbicide active ingredients:	**12,078**
Insecticides:	carbofuran	767
	phorate	641
	disulfoton	194
	carbaryl	178
	permethrin	176
	methamidophos	84
	fenvalerate	76
	esfenvalerate	42
	Total pounds insecticide active ingredients:	**2158**

Tomatoes

Table 12. Fungicides and herbicides applied on survey and state treated acres of tomatoes in Missouri, 1992.

Product	Active Ingredient	Treated Acres: Survey	State
Fungicides:			
Dithane M-45 (80WP)	mancozeb	46.0	224
Bravo 720 (6F)	chlorothalonil	29.0	141
Kocide 606 (3F)	copper hydroxide	28.0	136
Bravo 90DG	chlorothalonil	15.0	73
Ridomil 2E	metalaxyl	6.0	29
Benlate 50WP	benomyl	5.0	24
Bravo 500	chlorothalonil	5.0	24
Champion 50WP	copper hydroxide	4.8	23
Bravo W-75	chlorothalonil	4.1	20
Dithane F-45	mancozeb	3.0	15
Kocide 101	copper hydroxide	2.5	12
Not indicated	----	15.4	75
	Total Fungicide Treated Acres		**796**
	Total Tomato Acres Treated		**281**
	Mean Fungicide Treatments/Acre		**2.8**
Herbicides:			
Treflan 5	trifluralin	9.5	46
Sencor DF	metribuzin	9.0	44
Treflan EC, MTF	trifluralin	8.1	39
Poast	sethoxydim	1.0	5
Roundup	glyphosate	0.5	2
Treflan TR-10	trifluralin	0.4	2
Devrinol 2E	napropamide	0.3	2
Dacthal W-75	DCPA	0.2	1
Not indicated	----	8.2	40
	Total Herbicide Treated Acres		**181**
	Total Tomato Acres Treated		**181**
	Mean Herbicide Treatments/Acre		**1.0**

Tomatoes

Table 13. Insecticides applied on survey and state treated acres of tomatoes in Missouri, 1992.

Product	Active Ingredient	Treated Acres: Survey	State
Insecticides:			
Asana XL	esfenvalerate	44.9	218
Sevin 50W	carbaryl	34.9	170
Sevin 80S	carbaryl	24.1	117
Ambush 2E	permethrin	16.0	78
Cygon 400	dimethoate	15.0	73
Malathion 57%EL, 5EC	malathion	9.4	46
Sevin XLR Plus	carbaryl	7.3	36
Lannate L	methomyl	7.0	34
Dipel 2X	*Bacillus thuringiensis* var. *kurstaki*	4.6	22
Penncap-M	methyl parathion	4.0	19
Pounce 3.2EC	permethrin	3.4	17
Sevin 4F	carbaryl	2.9	14
Diazinon 50WP	diazinon	2.5	12
Pounce 25WP	permethrin	2.5	12
Phosdrin 4EC	mevinphos	1.0	5
Diazinon AG500	diazinon	0.8	4
Diazinon 14G	diazinon	0.1	<1
Methoxychlor	methoxychlor	0.1	<1
Not indicated	----	16.8	82
	Total Insecticide Treated Acres		**960**
	Total Tomato Acres Treated		**325**
	Mean Insecticide Treatments/Acre		**2.9**

Tomatoes

Table 14. Pounds of fungicide, herbicide, and insecticide active ingredients applied to estimated state acres of tomatoes in Missouri, 1992.

	Active Ingredient	Lbs. Applied to Estimated State Acres
Fungicides:	mancozeb	373
	chlorothalonil	362
	copper hydroxide	178
	metalaxyl	15
	benomyl	12
	Total pounds fungicide active ingredients:	**940**
Herbicides:	trifluralin	87
	metribuzin	26
	DCPA	7
	Other herbicides[a]	6
	Total pounds herbicide active ingredients:	**126**
Insecticides:	carbaryl	363
	dimethoate	37
	malathion	36
	methomyl	15
	methyl parathion	10
	diazinon	7
	esfenvalerate	6
	permethrin	5
	Other insecticides[b]	2
	Total pounds insecticide active ingredients:	**481**

[a] Three pounds or less each of napropamide, glyphosate, and sethoxydim.

[b] One pound or less each of methoxychlor, mevinphos, and *Bacillus thuringiensis* var. *kurstaki*.

Missouri Vegetables

Table 15. Total pounds of fungicide, and herbicide active ingredients applied to estimated state acres of four major vegetable crops (beans, cucurbits, potatoes, and tomatoes) grown in Missouri, 1992.

	Active Ingredient	Lbs. Applied to Estimated State Acres
Fungicides:	mancozeb	23,421
	chlorothalonil	12,279
	metalaxyl	1817
	benomyl	1556
	thiophanate-methyl	455
	copper hydroxide	391
	captan	386
	triadimefon	22
	Total pounds fungicide active ingredients:	**40,327**
Herbicides:	naptalam	8507
	metolachlor	7804
	metribuzin	2492
	pendimethalin	1375
	trifluralin	1335
	bensulide	1281
	DCPA	720
	propachlor	400
	sethoxydim	388
	glyphosate	384
	ethalfluralin	115
	clomazone	60
	quizalofop-P-ethyl	49
	other herbicides[a]	31
	Total pounds herbicide active ingredients:	**24,941**

[a] Bentazon, linuron, and napropamide with 21, 7, and 3 pounds of active ingredient, respectively.

Missouri Vegetables

Table 16. Total pounds of insecticide and fumigant active ingredients applied to state acres of four major vegetable crops (beans, cucurbits, potatoes, and tomatoes) grown in Missouri, 1992.

	Active Ingredient	Lbs. Applied to Estimated State Acres
Insecticides:	carbaryl	5959
	carbofuran	1504
	phorate	641
	permethrin	531
	Bacillus thuringiensis var. *kurstaki*	211
	acephate	197
	disulfoton	194
	methoxychlor	176
	malathion	104
	esfenvalerate	96
	methomyl	92
	methamidophos	84
	dimethoate	81
	fenvalerate	76
	azinphos-methyl	56
	diazinon	47
	other insecticides[a]	21
	Total pounds insecticide active ingredients:	**10,070**
Fumigants:	dichloropropene	67
	Total pounds fumigant active ingredient:	**67**

[a] Thirteen pounds or less each of methyl parathion, mevinphos, and, fenvalerate.

Major Pests of Fresh Market Beans

Figure 1.

Which diseases caused the greatest economic loss to your 1992 fresh market bean crop?

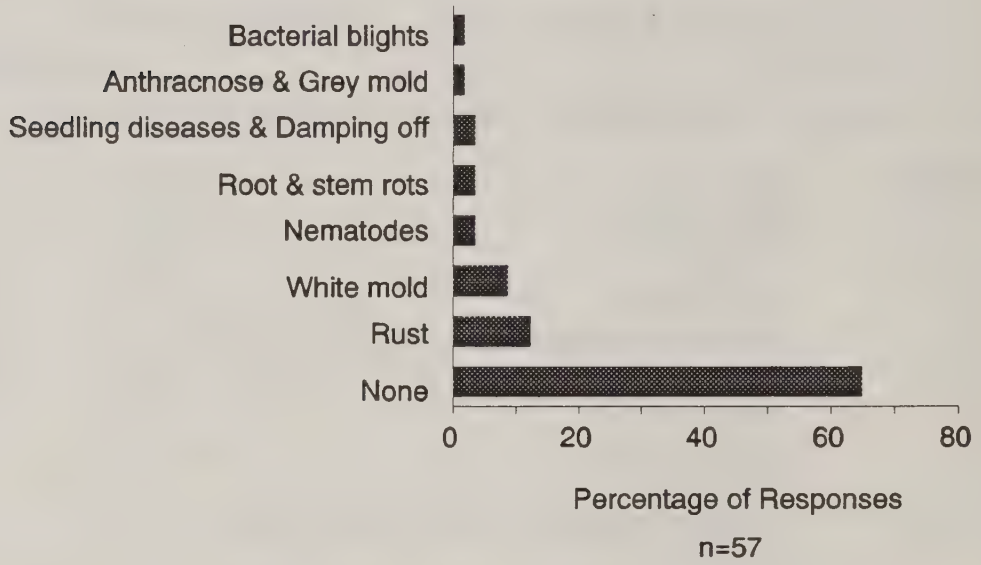
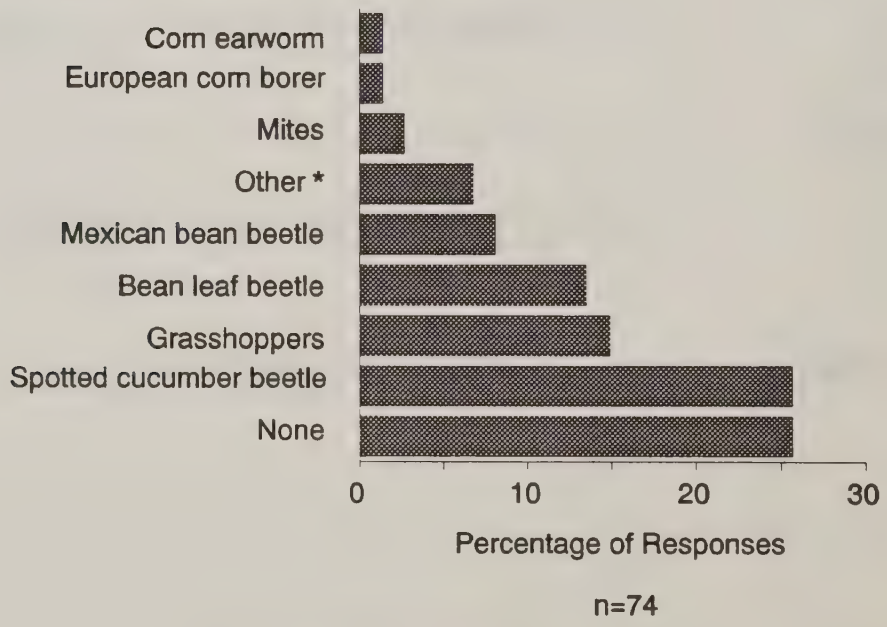


Figure 2.

Which insects caused the greatest economic loss to your 1992 fresh market bean crop?

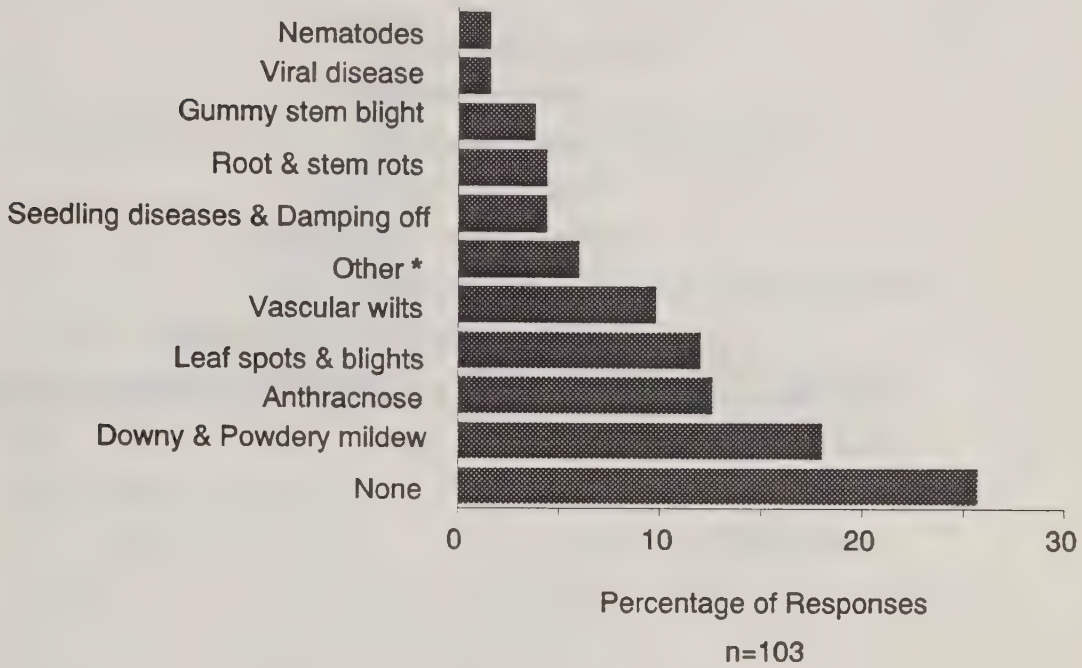


* Stink bugs and weevils

Major Pests of Cucurbits

Figure 3.

Which diseases caused the greatest economic loss to your 1992 cucurbit crop?

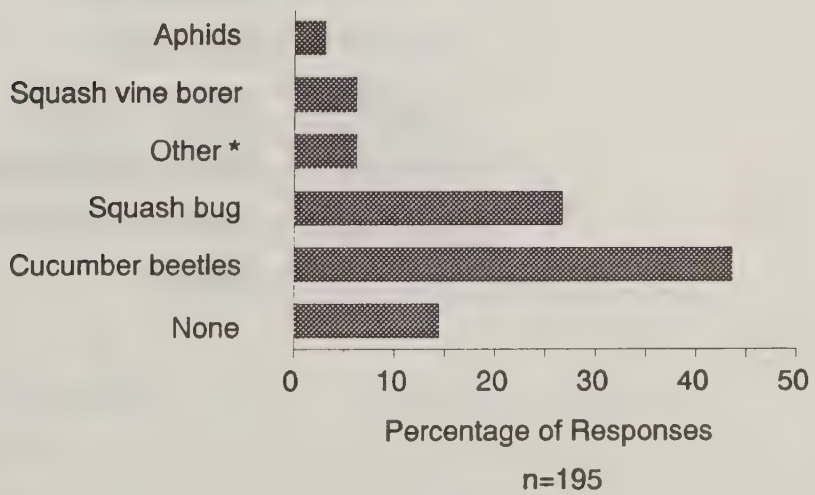


* Various fruit rots, sooty blotch, and fungus due to excessive rain

---

Figure 4.

Which insects caused the greatest economic loss to your 1992 cucurbit crop?



* Numerous insects; only blister beetle listed more than once

Major Pests of Potatoes

Figure 5.

Which diseases caused the greatest economic loss to your 1992 potato crop?

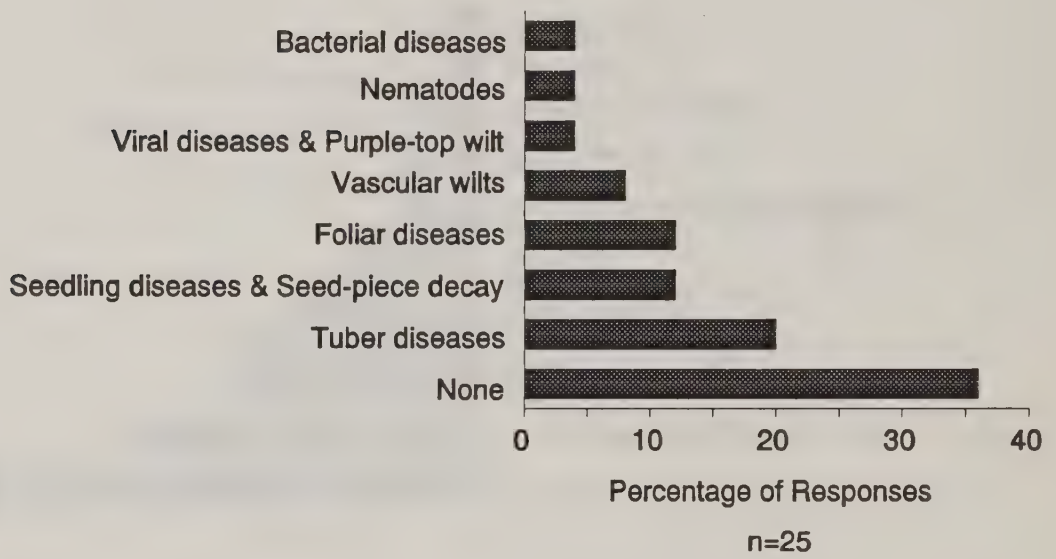
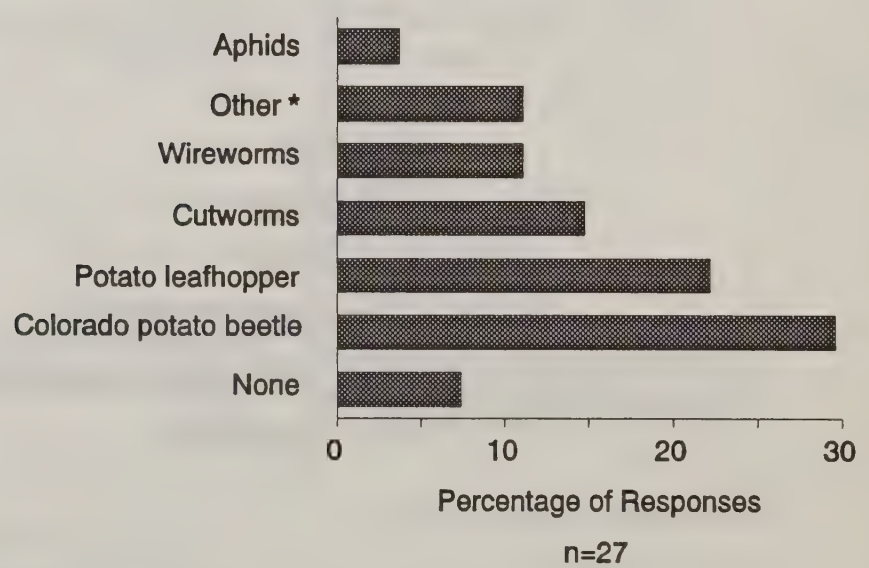


Figure 6.

Which insects caused the greatest economic loss to your 1992 potato crop?

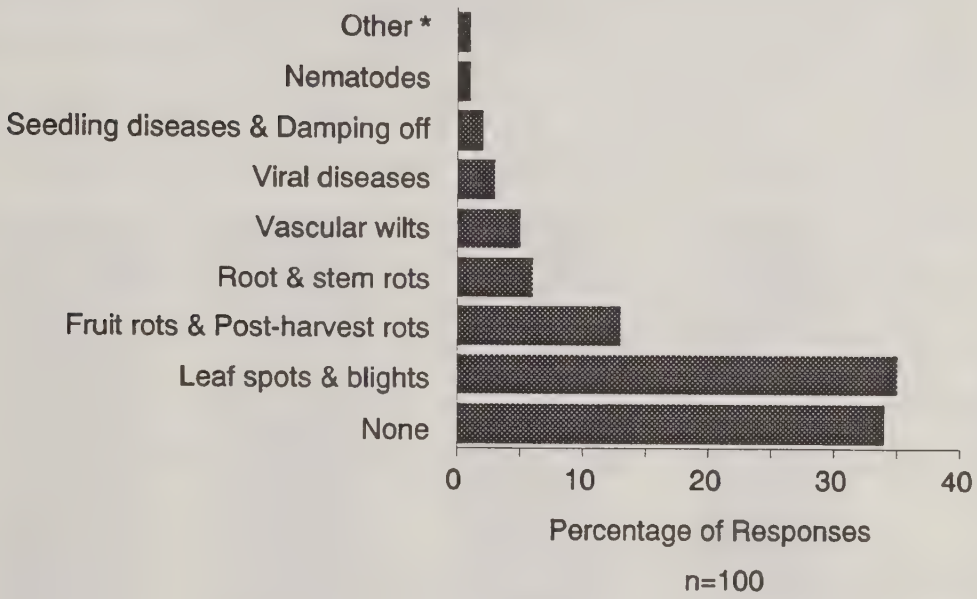


* European corn borer and grubs

Major Pests of Tomatoes

Figure 7.

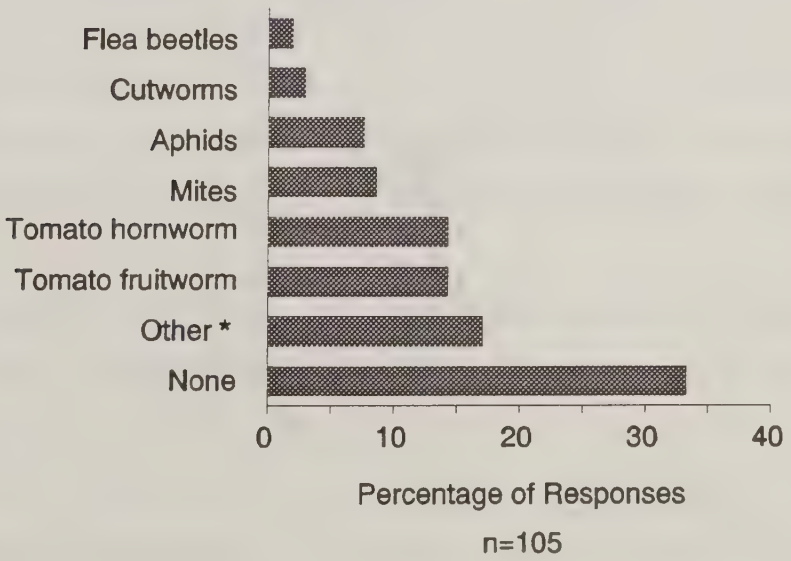
Which diseases caused the greatest economic loss to your 1992 tomato crop?



* Various unidentified fungi

Figure 8.

Which insects caused the greatest economic loss to your 1992 tomato crop?

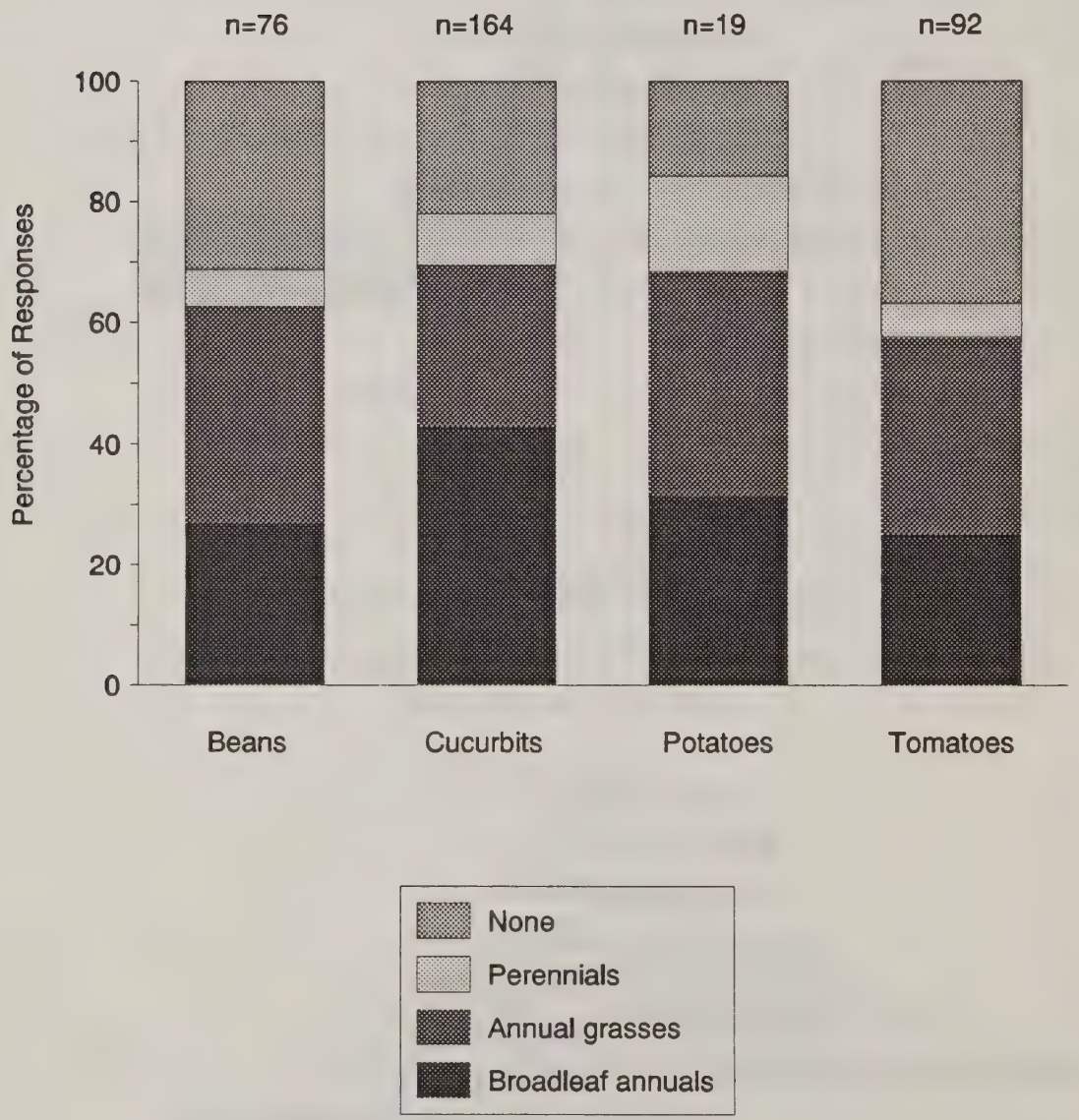


* Stink bugs, grasshoppers, and blister beetles

Weed Pests of Vegetables

Figure 9.

Which weed classes caused the greatest money loss to your 1992 vegetable crop?



Nursery Crops

Sixty producers of nursery crops, with 1484 acres in production, responded to the survey. This represents 13% of the estimated 11,250 acres in nursery stock production in Missouri in 1992. Fungicides were applied on 53.1%, herbicides on 54.1%, insecticides on 56.2%, and growth regulators on 0.01% of the surveyed acreage (Table 17). Acreage treated with pesticides received an average of 3.3 applications of fungicides, 1.4 applications of herbicides, 4.7 applications of insecticides, and 1.0 application of growth regulators (Tables 18-20).

Fungicides were applied to an estimated 21,674 treated acres in the state (Table 18). Chlorothalonil was applied to an estimated 9546 acres which represents 44% of the total fungicide treated acres (Table 18). Maneb, the second most commonly used fungicide, was applied to an estimated 4555 acres which represents 21% of the total fungicide treated acres (Table 18).

Herbicides were applied to an estimated 14,625 treated acres in the state (Table 19). Oryzalin, the most commonly used herbicide, was applied to 3225 acres which represents 22% of the herbicide treated acres (Table 19). Glyphosate, the second most commonly used herbicide, was applied to 2838 acres which represents 19% of the herbicide treated acres (Table 19).

Insecticides were applied to an estimated 51,597 treated acres in the state (Table 20). Carbaryl, the most commonly used insecticide, was applied to 10,798 acres which represents 21% of the total insecticide treated acres (Table 20). Two biological control agents were used on nursery crops. Parasitic wasps were released on an estimated 1516 treated acres while *Bacillus thuringiensis* was applied to an estimated 456 treated acres (Table 20).

Growth regulators were applied to an estimated 4 treated acres in the state (Table 18). Daminozide, the most commonly used growth regulator, was applied to 4 acres, however, it was the only growth regulator with enough data from respondents to calculate treated acres (Table 18). Indole-3-butyric acid was used as a cutting dip and paclobutrazol was applied but no acreage was indicated. Overall, growth regulators were used by few producers.

Disease categories reported to cause the greatest economic losses were rusts & mildews (23.0%) and leaf spots & blights (21.3%) (Fig. 10). The insects reported to cause the greatest economic loss were aphids (13.6%), although grasshoppers and borers were frequently listed under "other" (Fig. 11). The weed class reported to cause the greatest economic loss was grass (25.9%) (Fig. 12).

Nursery surveys included a section with questions about alternative control measures that respondents would choose if the registration on current chemicals was canceled. If the fungicides presently used were canceled, 43% of the 46 respondents indicated they would use another fungicide, 26% would use resistant varieties, 24% would improve sanitation, 4% would not use fungicides, while 2% would use field spacing for increased ventilation (listed as "other") (Fig. 13). Most of the respondents felt that using fungicide alternatives would simultaneously decrease plant production and increase costs by less than 10% (Fig. 13,14).

If the herbicides presently used were canceled, 47% of the 58 respondents indicated they would use another herbicide, 24% would either rotate crops or mow, and 5% would not use herbicides (Fig. 15). Most respondents felt that using herbicide alternatives would simultaneously decrease plant production and increase costs by 10% or less (Fig. 15,16).

If the insecticides presently used were canceled, 48% of the 61 respondents indicated they would use another insecticide and 26% would use either cultural control or beneficial insects (Fig. 17). Most respondents felt that using insecticide alternatives would simultaneously decrease plant production and increase costs by 10% or less (Fig. 17,18).

Nursery Crops

Table 17. Survey acres of nursery crops treated with insecticides, herbicides, fungicides, and growth regulators in Missouri, 1992.

Crop Reporting District	Response Number	Survey Acres	Percentage of Acres Treated			
			Insecticide	Herbicide	Fungicide	Growth Regulator
Northwest	4	7.4	14%	18%	14%	0%
North Central	2	5.2	38%	38%	0%	4%
Northeast	1	160.0	100%	100%	100%	0%
West Central	12	87.7	30%	37%	13%	0%
Central	6	4.8	62%	52%	31%	0%
East Central	18	731.5	71%	62%	65%	0%
Southwest	9	344.0	33%	33%	37%	0%
South Central	5	79.0	7%	50%	9%	0%
Southeast	3	64.1	2%	0%	2%	0%
Survey Totals:	60	1483.8				
Percent of Total Acres Treated:			56.2%	54.1%	53.1%	0.01%

Nursery Crops

Table 18. Fungicides and growth regulators applied on survey and state treated acres of nursery crops in Missouri, 1992.

Product	Active Ingredient	Treated Acres: Survey	State
Fungicides:			
Bravo, Daconil 2787	chlorothalonil	1259	9546
Maneb	maneb	601	4555
Benlate, Tersan	benomyl	360	2727
Rubigan	fenarimol	200	1516
Karathane	dinocap	100	758
Ornalin, Ronilan	vinclozolin	100	758
Agri-strep, Agrimycin	streptomycin	80	607
Bayleton	triadimefon	80	607
Captan	captan	43	326
Zyban	thiophanate-methyl + mancozeb	12	91
Other[a]		3	21
Not indicated	----	21	162
	Total Fungicide Treated Acres		**21,674**
	Total Nursery Acres Treated		**6,470**
	Mean Fungicide Treatments/Acre		**3.3**
Growth Regulators:			
B Nine	daminozide	0.5	4
Hormodin, Rootone	indole-3-butyric acid	(cutting dip)	
Bonzi, Clipper	paclobutrazol	(no acreage given)	
	Total Growth Regulator Treated Acres		**4**
	Total Nursery Acres Treated		**3.8**
	Mean Growth Regulator Treatments/Acre		**1.0**

[a] Triforine, zineb, hydrated lime plus copper sulfate, and iprodione.

Nursery Crops

Table 19. Herbicides applied on survey and state treated acres of nursery corps in Missouri, 1992.

Product	Active Ingredient	Treated Acres: Survey	State
Herbicides:			
Surflan	oryzalin	425	3225
Rodeo, Roundup	glyphosate	374	2838
Aquazine, Caliber, Princep, Simazine	simazine	185	1403
Gramoxone, Starfire	paraquat	180	1365
Kerb	pronamide	160	1213
Judge, Lasso, Partner	alachlor	150	1137
2,4-D	2,4-D	101	766
Oust	sulfometuron methyl	100	758
Goal	oxyfluorfen	50	379
Poast, Vantage	sethoxydim	37	278
Treflan	trifluralin	35	267
Dacthal	DCPA	25	190
Other[a]		25	198
Not indicated	----	81	608
	Total Herbicide Treated Acres		**14,625**
	Total Nursery Acres Treated		**10,130**
	Mean Herbicide Treatments/Acre		**1.4**

[a] Metolachlor, oryzalin plus isoxaben, oxadiazon, dazomet, diuron, hexazinone, fluazifop-butyl, benefin plus trifluralin, and benefin.

Nursery Crops

Table 20. Insecticides applied on survey and state treated acres of nursery crops in Missouri, 1992.

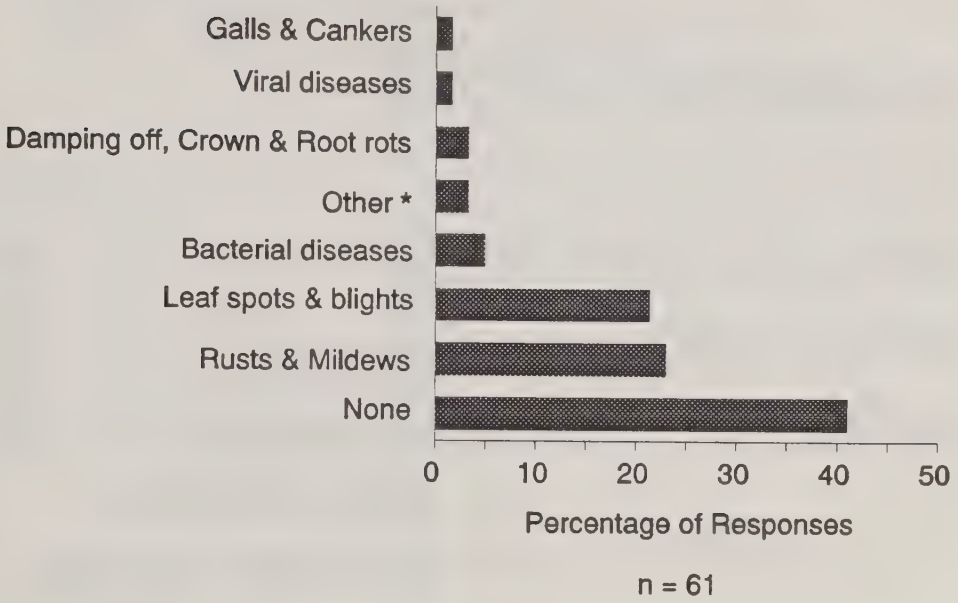
Product	Active Ingredient	Treated Acres: Survey	State
Insecticides:			
Carbaryl, Sevimol, Sevin	carbaryl	1424	10,798
Malathion, Cythion	malathion	1160	8793
Methoxychlor	methoxychlor	1000	7582
Kelthane	dicofol	565	4282
Vydate	oxamyl	540	4094
Ambush, Atroban, Ectiban, Pounce, Pramex	permethrin	403	3054
Orthene	acephate	244	1848
Dursban, Lorsban	chlorpyrifos	236	1790
Carzol	formetanate hydrochloride	200	1516
Imidan	phosmet	200	1516
Joust, Morestan	oxythioquinox	200	1516
Comite, Omite, Ornamite	propargite	200	1516
Parasitic wasps	(numerous species)	200	1516
Cygon	dimethoate	89	677
Biobit, Dipel, Foray, Javelin, MVP, Thuricide	*Bacillus thuringiensis* var. *kurstaki*	60	456
Endosulfan, Thiodan	endosulfan	40	303
Lindane, Gamma-Mean	lindane	20	152
Mavrik, Spur	fluvalinate	9	69
Diazinon	diazinon	6	48
Insecticidal Soap	potassium salts of fatty acids	6	43
Other[a]		1	10
Not indicated	----	2	18
	Total Insecticide Treated Acres		**51,597**
	Total Nursery Acres Treated		**10,973**
	Mean Insecticide Treatments/Acre		**4.7**

[a] Trichlorfon, pyrethrin, disulfoton, and petroleum oils.

Major Pests of Nursery Crops

Figure 10.

Which diseases caused the greatest economic loss to your 1992 nursery crops?

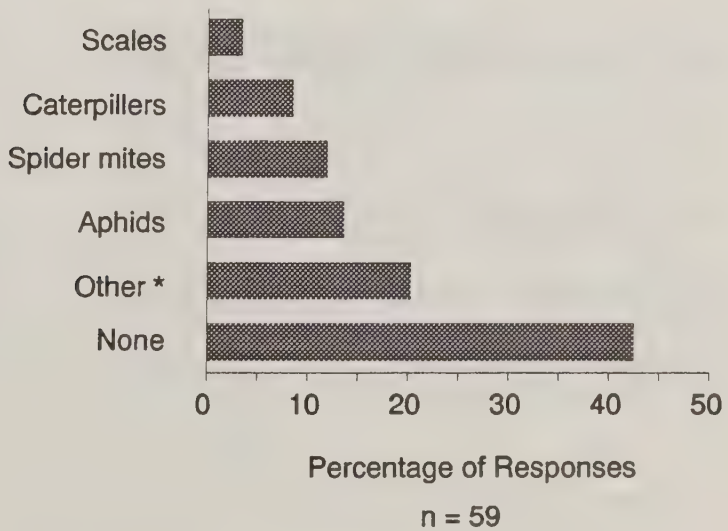


n = 61

* Nematodes and ozone damage

Figure 11.

Which insects caused the greatest economic loss to your 1992 nursery crops?



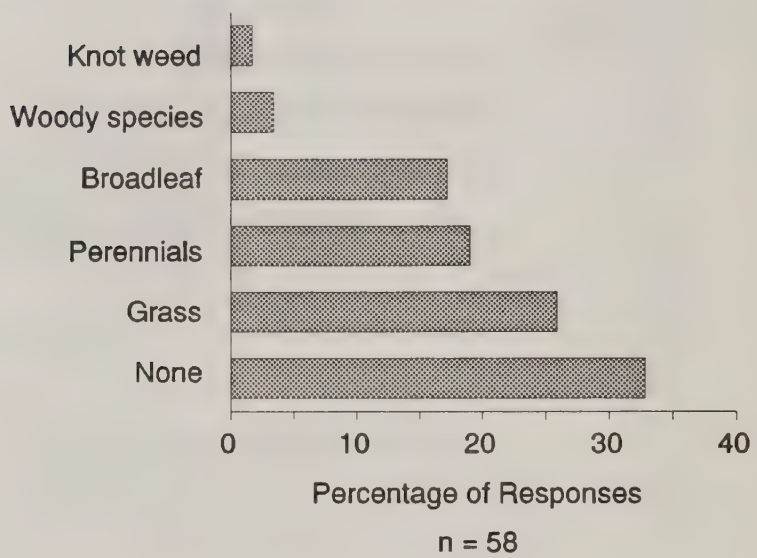
n = 59

* Primarily borers and grasshoppers

Weeds of Nursery Crops

Figure 12.

Which weed types caused the greatest economic loss to your 1992 nursery crops?



Nursery Fungicide Alternatives

Figure 13.

If the fungicides you use in your operation were canceled, which of the following alternatives would you choose, and what would be your estimated change in plant production?

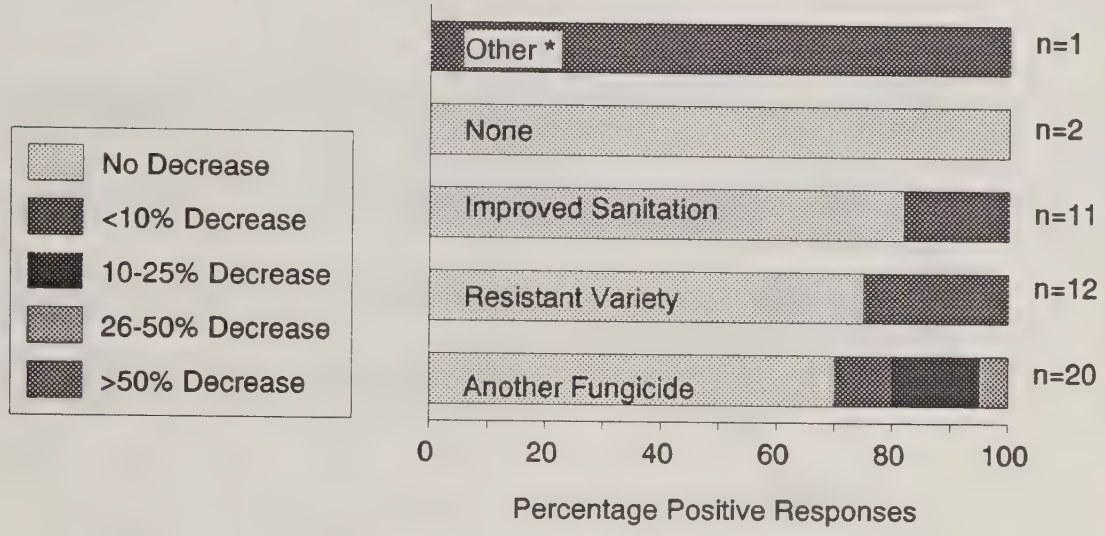
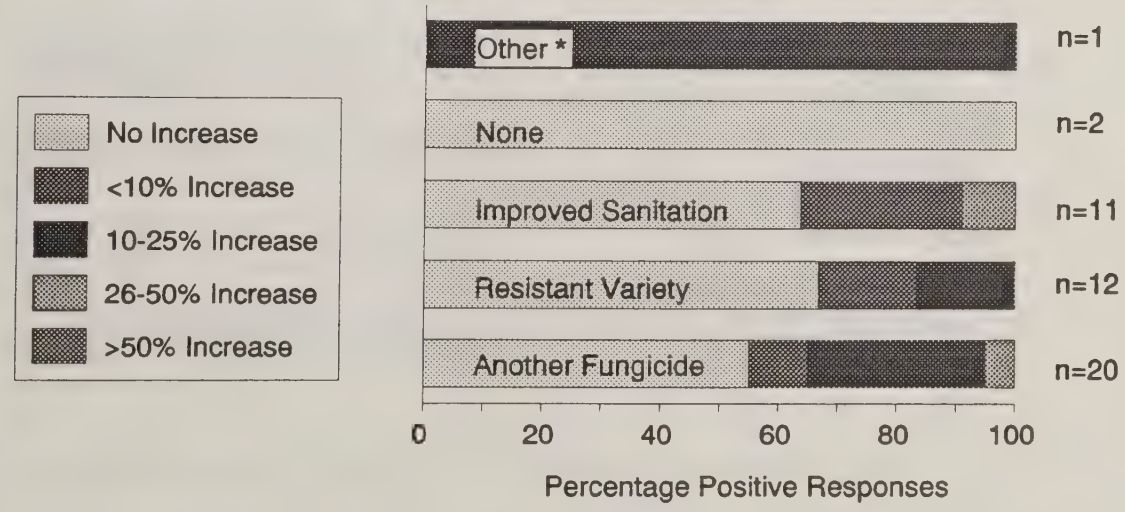


Figure 14.

If the fungicides you use in your operation were canceled, which of the following alternatives would you choose, and what would be your estimated change in production costs?



* Field spacing for ventilation

Nursery Herbicide Alternatives

Figure 15.

If the herbicides you use in your operation were canceled, which of the following alternatives would you choose, and what would be your estimated change in plant production?

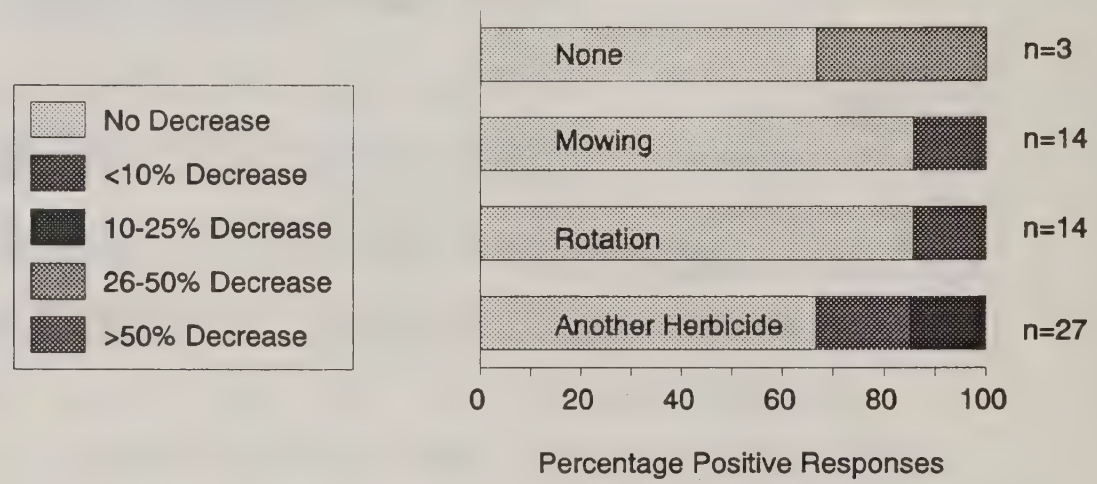
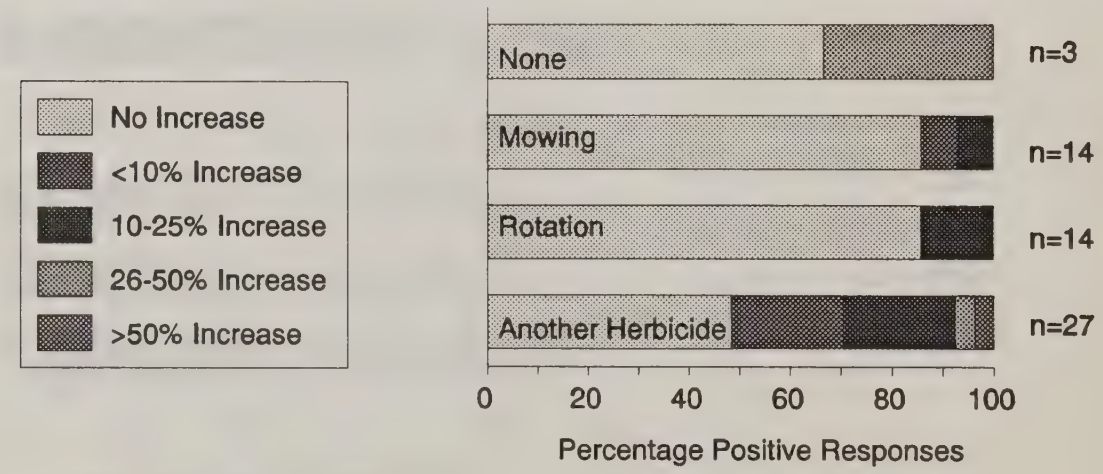


Figure 16.

If the herbicides you use in your operation were canceled, which of the following alternatives would you choose, and what would be your estimated change in production costs?



Nursery Insecticide Alternatives

Figure 17.

If the insecticides you use in your operation were canceled, which of the following alternatives would you choose, and what would be your estimated change in plant production?

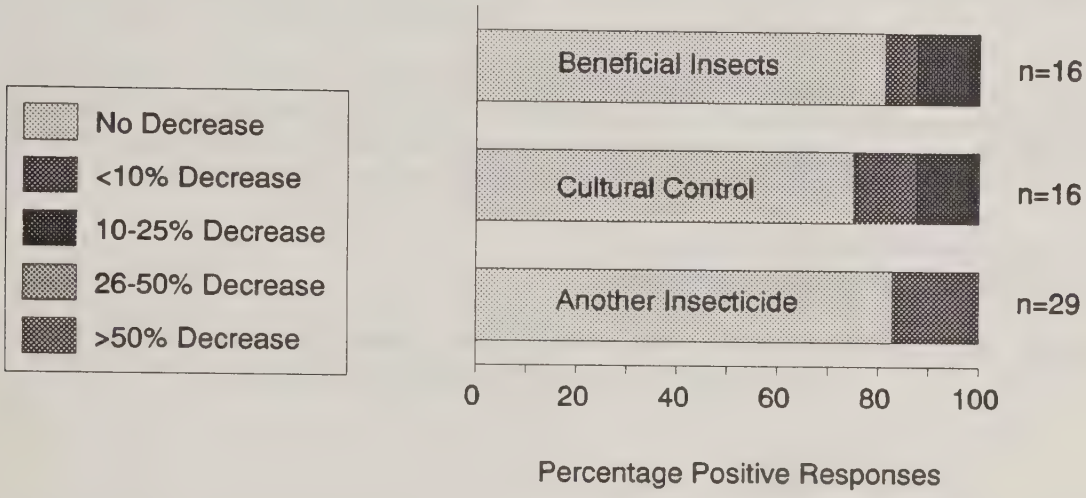
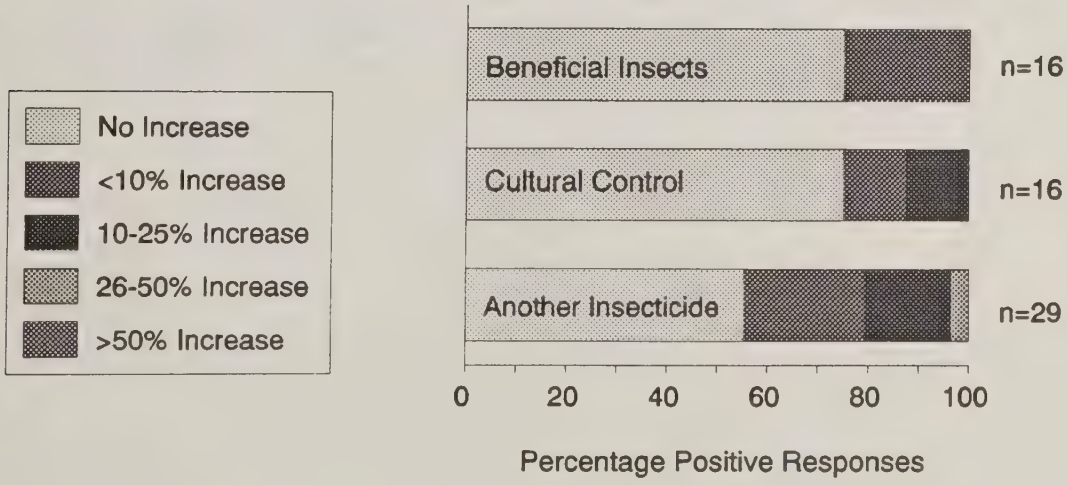


Figure 18.

If the insecticides you use in your operation were canceled, which of the following alternatives would you choose, and what would be your estimated change in production costs?



Dear Producer:

The United States Department of Agriculture (through its National Agricultural Pesticide Impact Assessment Program) has requested that the University of Missouri provide pesticide usage information on crop production in Missouri. Recent developments regarding pesticides in ground water, residues in food, endangered species, and the acceleration of the EPA reregistration program have placed increased pressure on agricultural production systems. **It is important that we have accurate and current information to support their continued registration and use, and that we document their economic necessity to vegetable production in Missouri.**

In order to collect this information, we need your cooperation in completing this survey. **Your response is completely voluntary and confidential; it is not required by law.** This information will be used to develop summaries of regional and statewide pesticide usage in crop production. We can then provide statistical documentation to administrators and legislators of the importance of pesticides to Missouri's agricultural producers. We appreciate your valuable time and cooperation.

Integrated Pest Management, University of Missouri
Statistical Reporting Service, USDA

*****A REMINDER NOTICE WILL BE SENT APPROXIMATELY 1 WEEK AFTER YOU RECEIVE THIS SURVEY. WE SINCERELY APPRECIATE YOUR ASSISTANCE*****

CROP ACREAGE

For all the acreage in your operation in 1992 (including rented land), please complete the following table for the number of those acres treated **at least once** with an insecticide, herbicide, or fungicide.

	Acres Planted	Ave. Yield (lbs./acre)	Number of Acres Treated with:		
			Insecticides	Herbicides	Fungicides
Tomatoes					
Fresh Market Beans					
Cucurbits (cucumbers, melons, pumpkins, & squash)					

PESTICIDES USED ON TOMATOES

From the list of pesticides registered for use on tomatoes, find those that you applied at least once to the crop or crop acreage. For each pesticide used, please write down the pesticide number, the number of acres you treated with that pesticide, the number of times you applied that pesticide to the listed acres, and the rate applied.

Pesticide number	Acres treated	Number of times applied	Rate applied

PESTICIDES REGISTERED FOR USE ON TOMATOES

INSECTICIDES		Rate / acre
100.	Asana XL	2.9-9.6 fl. oz.
101.	Biobit FC	0.5-7.0 pt.
102.	Biobit WP	0.25-4.0 lb.
103.	Cygon 400	0.5-1.0 pt.
104.	Cythion ULV	6.0-8.0 fl. oz.
105.	Cythion 57%EC	1.5-5.5 pt.
106.	Diazinon 14G	7-28 lb.
107.	Diazinon 50WP	0.5-1.5 lb.
108.	Diazinon AG500	0.5-1.5 pt.
109.	Dipel 2X	0.5-2.0 lb.
110.	Dipel 4L	0.5-4.0 pt.
111.	Di-Syston 8	1-3 pt.
112.	Dyfonate 4EC	2 qt.
113.	Dyfonate II 10G	20 lb.
114.	Dylox 80SP	20 oz.
115.	Guthion 2S, 2L	1.5-6.0 pt.
116.	Guthion 35%WP	1.06-4.25 lb.
117.	Guthion 50%WP	0.75-3.0 lb.
118.	Javelin WG	0.125-1.5 lb.
119.	Kelthane MF	0.75-1.5 pt.
120.	Kryocide	15-30 lb.
121.	Lannate 90	0.25-1.0 lb.
122.	Lannate L	1-4 pt.
123.	Lannate LV	0.75-3.0 pt.
124.	Melathion 57%EL, 5EC	1.5-2.75 pt.
125.	Methoxychlor 4L	1-3 qt.
126.	Methoxychlor 2EC	75-100 fl. oz.
127.	Methyl Parathion 4E	1-3 pt.
128.	Methyl Parathion 6E	0.67-2.0 pt.
129.	Methyl Parathion 2 Thiodan EC	0.75-1.33 qt.
130.	Penncap-M	2-4 pt.
131.	Phosdrin 4EC	0.25-1.0 pt.
132.	Pounce 3.2 EC	2-8 fl. oz.
133.	Pounce 25 WP	3.2-12.8 oz.
134.	Proxol 80SP	20 oz.
135.	Sevin XLR Plus	1-4 pt.
136.	Sevin 80S	0.66-2.5 lb.
137.	Sevin 50W	1-4 lb.
138.	Sevin 4F	1-4 pt.
139.	Thiodan 2 CO EC	1-2 qt.
140.	Thiodan 3EC	0.66-1.33 qt.
141.	Thiodan 50WP	1-2 lb.
142.	Trident II	1.5-2.0 qt.
143.	Vydate L	2-4 pt.
144.	Other (please list with rate)	

HERBICIDES		Rate / acre
200.	Dacthal W-75	6-14 lb.
201.	Devrinol 2E	0.5-1.0 gal.
202.	Devrinol 50WP, 50DF	2-4 lb.
203.	Gramoxone Extra	2-3 pt.
204.	Lexone 4	0.33-2.0 pt.
205.	Lexone DF	0.33-1.33 lb.
206.	Poast	0.5-1.5 pt.
207.	Prefar 4E	4-5 qt.
208.	Roundup	2-3 qt.
209.	Sencor 4	0.33-2.0 pt.
210.	Sencor DF	0.33-1.33 lb.
211.	Tillam 6E	2.66-4.0 qt.
212.	Treflan TR-10	5-10 lb.
213.	Treflan EC, MTF	1-2 pt.
214.	Treflan 5	0.8-1.6 pt.
215.	Treflan 80DC	10-20 oz.
216.	TRI-4	1.0-1.5 pt.
217.	Other (please list with rate)	

FUNGICIDES		Rate / acre
300.	Benlate 50WP	0.5-1.0 lb.
301.	Bravo 500	2-4 pt.
302.	Bravo 720 (6F)	1.375-3.0 pt.
303.	Bravo W-75	1.5-3.0 lb.
304.	Bravo 90DG	1.125-2.25 lb.
305.	Champion 50WP	2-3 lb.
306.	Copper Sulfate, Tribasic 53WP	2-4 lb.
307.	Dithane DF	1.5-3.25 lb.
308.	Dithane M-45 (80WP)	1.5-3.0 lb.
309.	Dithane F-45	1.2-2.4 qt.
310.	Dyrene 50WP	2-5 lb.
311.	Kocide 606 (3F)	3-4 pt.
312.	Manzate 200 DF	1.5-3.0 lb.
313.	Penncozeb 80WP	1.5-3.0 lb.
314.	Penncozeb DF (75DG)	1.5-3.0 lb.
315.	Ridomil 5G	10-20 lb.
316.	Ridomil 2E	2-8 pt.
317.	Ridomil MZ-58	1.5-2.0 lb.
318.	Ridomil/Bravo 81W	1.5-3.0 lb.
319.	Other (please list with rate)	

FUMIGANTS		Rate / acre
400.	Telone II	9-18 gal.
401.	Telone C-17	10.3-17.1 gal.
402.	Vapam	75-100 gal.
403.	Vorlex	7-15 gal.
404.	Other	

ALL RATES ARE LISTED ON A "PER ACRE" BASIS; FOR BAND TREATMENTS, PLEASE ADJUST.

PESTICIDES REGISTERED FOR USE ON FRESH MARKET BEANS

Insecticides	Rate / acre
601. Asana XL	2.9-9.6 fl. oz.
602. Biobit FC	0.5-7.0 pt.
603. Biobit WP	0.25-4.0 lb.
604. Cygon 400	0.5-1.0 pt.
605. Cythion ULV	8 fl. oz.
606. Cythion 57%EC	1.5-2.0 pt.
607. Diazinon 14G	14-28 lb.
608. Diazinon 50WP	0.5-1.5 lb.
609. Diazinon AG500	0.75-1.5 pt.
610. Dibrom 8 Emulsive	1.0-1.5 pt.
611. Dipel 2X	0.5-2.0 lb.
612. Dipel ES	1-4 pt.
613. Dipel 4L	0.5-4.0 pt.
614. Di-Syston 15G	6.7-13.3 lb.
615. Di-Syston 8	1-2 pt.
616. Dyfonate 4EC	2-4 qt.
617. Dyfonate II 10G	20-40 lb.
618. Kelthane MF	0.75-1.0 pt.
619. Lannate 90	0.25-1.0 lb.
620. Lannate L	1-4 pt.
621. Lannate LV	0.75-3.0 pt.
622. Malathion 57%EL, 5EC	1.5-2.0 pt.
623. Metasystox-R	2.0 pt.
624. Methoxychlor 4L	1-3 qt.
625. Methoxychlor 2EC	75-100 fl. oz.
626. Methyl Parathion 4E	1-3 pt.
627. Methyl Parathion 6E	0.67-2.0 pt.
628. Methyl Parathion 2 Thiodan EC	0.66-1.33 qt.
629. Mocap 10%	60-80 lb.
630. Mocap EC	1.0-1.33 gal.
631. Orthene 75S	0.33-1.33 lb.
632. Penncap-M	2-4 pt.

Insecticides (Continued)	Rate / acre
633. Phosdrin 4EC	0.25-1.0 pt.
634. Sevin XLR Plus	1-4 pt.
635. Sevin 80S	0.66-2.5 lb.
636. Sevin 50W	1-3 lb.
637. Sevin 4F	1-4 pt.
638. Thimet 15G	6.0-12.5 oz./ 1000 ft. row
639. Thimet 20G	4.5-9.4 oz./ 1000 ft. row
640. Thiodan 2 CO EC	1-2 qt.
641. Thiodan 3EC	0.66-1.33 qt.
642. Thiodan 50WP	1-2 lb.
643. Other	

Herbicides	Rate / acre
701. Basagran	1.5-2.0 pt.
702. Dacthal W-75	6-14 lb.
703. Dual	1.25-3 pt.
704. Eptam 7-E	3.5-4.5 pt.
705. Eptam 10G	30-40 lb.
706. Gramoxone Extra	2-3 pt.
707. Poast	0.5-1.5 pt.
708. Prowl 4EC	1-3 pt.
709. Prowl 3.3EC	1.2-3.6 pt.
710. Roundup	2-3 qt.
711. Treflan TR-10	5.0-7.5 lb.
712. Treflan EC, MTF	1.0-1.5 pt.
713. Treflan 5	0.8-1.6 pt.
714. Treflan 80DC	10-15 oz.
715. TRI-4	1.0-1.5 pt.
716. Other	

Fungicides	Rate / acre
801. Benlate 50WP	1.5-2.0 lb.
802. Botran 75WDG	3 lb.
803. Bravo 720 (6F)	1.375-3.0 pt.
804. Bravo W-75	3 lb.
805. Bravo 90DG	1.125-2.5 lb.
806. Bravo 500	2.0-4.25 pt.
807. Kocide 101 (50WP)	2-4 lb.
808. Kocide 606 (3F)	2-4 lb.
809. Ridomil 2E	2-4 pt.
810. Ridomil PC 11G	12 oz./ 1000 ft. row
811. Rovral 4F	1.5-2.0 pt.
812. Rovral 50WP	1.5-2.0 lb.
813. Terraclor	0.5-1.0 gal.
814. Terraclor 75WP	1.33-2.75 lb.
815. Terraclor 10G	0.75-1.0 lb./ 1000 ft.
816. Topsin M 70WP	1-2 lb.
817. Topsin M 4.5F	20-40 fl. oz.
818. Topsin M 85WDG	0.8-1.6 lb.
819. Other	

Fumigants	Rate / acre
901. Telone II	9-18 gal.
902. Telone C-17	10.3-17.1 gal.
903. Other	

PESTICIDES REGISTERED FOR USE ON CUCURBITS (cucumbers, melons, pumpkins, & squash)

Insecticides	Rate / acre
11. Ambush 2E	6.4-12.8 fl. oz.
12. Ambush 25W	6.4-12.8 oz.
13. Asana XL	5.8-9.6 fl. oz.
14. Biobit FC	0.5-7.0 pt.
15. Biobit WP	0.25-4.0 lb.
16. Cygon 400	0.5-1.0 pt.
17. Cythion 57%EC	1.5-3.0 pt.
18. Diazinon 14G	14-28 lb.
19. Diazinon 50WP	0.5-1.5 lb.
20. Diazinon AG500	0.5-1.5 pt.
21. Dipel 2X	0.5-2.0 lb.
22. Dipel 4L	0.5-4.0 pt.
23. Dylox 80SP	10-20 oz.
24. Furadan 15G (insects)	8-12 oz./ 1000 ft. row
25. Furadan 15G (nematodes)	1.5 lb./ 1000 ft. row
26. Guthion 2S, 2L	1.5-2.0 pt.
27. Guthion 35%WP	1.06-1.44 lb.
28. Guthion 50%WP	0.75-1.0 lb.
29. Javelin WG	0.25-1.5 lb.
30. Kelthane 35	1.0-1.66 lb.
31. Kryocide	15-25 lb.
32. Lannate 90	0.5-1.0 lb.
33. Lannate L	2-4 pt.
34. Lannate LV	1.5-3.0 pt.
35. Malathion 57%EL, EC	1.5-3.0 pt.
36. Metasystox-R	1.5-2.0 pt.
37. Methoxychlor 4L	1-3 qt.
38. Methoxychlor 2EC	75-100 fl. oz.
39. Methyl Parathion (7.5 lb./gal.)	0.25 pt.
40. Mocap 10%	20 lb.

Insecticides (Continued)	Rate / acre
41. Mocap EC	1.33 qt.
42. Phosdrin 4EC	0.25-1.0 pt.
43. Pounce WSB	0.1-0.2 lb.
44. Pounce 3.2 EC	4-8 fl. oz.
45. Pounce 25WP	6.4-12.8 oz.
46. Proxol 80SP	10-20 oz.
47. Sevin XLR Plus	0.5-1.0 qt.
48. Sevin 80S	0.66-1.875 lb.
49. Sevin 50W	1-2 lb.
50. Sevin 4F	0.5-2.0 qt.
51. Thiodan 2 CO EC	1-2 qt.
52. Thiodan 3EC	0.66-1.33 qt.
53. Thiodan 50WP	1-2 lb.
54. Vydate L (preplant, planting)	1-2 gal.
55. Vydate L (foliar)	2-4 pt.
56. Other	

Herbicides	Rate / acre
57. Alanap-L	4-8 qt.
58. Command 4EC	1.0-2.5 pt.
59. Curbit EC	3-4 pt.
60. Dacthal W-75	6-14 lb.
61. Gramoxone Extra	2-3 pt.
62. Poast	0.5-1.5 pt.
63. Prefar 4E	4-6 qt.
64. Ramrod 4L	4-6 qt.
65. Roundup	2-3 qt.
66. Treflan TR-10	5-10 lb.
67. Treflan EC, MTF	1-2 pt.
68. Treflan 5	0.8-1.2 pt.

Herbicides (Continued)	Rate / acre
69. Treflan 80DC	10-20 oz.
70. Other	

Fungicides	Rate / acre
71. Bayleton 50DF	2-4 oz.
72. Benlate 50WP	4-8 oz.
73. Bravo 500	2.25-4.25 pt.
74. Bravo 720 (6F)	1.5-3.0 pt.
75. Bravo W-75	1.5-3.0 lb.
76. Bravo 90DG	1.25-2.5 lb.
77. Champion 50WP	2-3 lb.
78. Citcop 5E	3 pt.
79. Kocide 101 (50WP)	2-3 lb.
80. Ridomil 2E	4-8 pt.
81. Ridomil/Bravo 81W	1.5-3.0 lb.
82. Topsin M 70WP	4-8 oz.
83. Topsin M 85WDG	3.2-6.4 oz.
84. Other	

Fumigants	Rate / acre
85. Telone II	9-18 gal.
86. Telone C-17	10.3-17.1 gal.
87. Vorlex	12 gal.
88. Other	

ALL RATES ARE LISTED ON A "PER ACRE" BASIS UNLESS OTHERWISE INDICATED. FOR BAND TREATMENTS, PLEASE REDUCE AMOUNTS ACCORDING TO THE PORTION OF ACRE TREATED.

PESTICIDES USED ON FRESH MARKET BEANS

From the list of pesticides registered for use on fresh market beans, find those that you applied at least once to the crop or crop acreage. For each pesticide used, please write down the pesticide number, the number of acres you treated with that pesticide, the number of times you applied that pesticide to the listed acres, and the rate applied.

Pesticide number	Acres treated	Number of times applied	Rate applied

PESTICIDES USED ON CUCURBITS (cucumbers, melons, pumpkins, & squash)

From the list of pesticides registered for use on cucurbits, find those that you applied at least once to the crop or crop acreage. For each pesticide used, please write down the pesticide number, the number of acres you treated with that pesticide, the number of times you applied that pesticide to the listed acres, and the rate applied.

Pesticide number	Acres treated	Number of times applied	Rate applied

PESTS OF TOMATOES, FRESH MARKET BEANS, AND CUCURBITS

A. What **TYPE OF WEED(S)** caused the greatest money loss to your 1992 tomato, fresh market bean, or cucurbit cro? (Please circle the number of the most accurate answer(s) for each crop produced).

TOMATOES
1. Broadleaf Annuals
2. Annual Grasses
3. Perennials
4. None

BEANS
1. Broadleaf Annuals
2. Annual Grasses
3. Perennials
4. None

CUCURBITS
1. Broadleaf Annuals
2. Annual Grasses
3. Perennials
4. None

B. What **INSECT(S)** caused the greatest money loss to your 1992 tomato, fresh market bean, or cucurbit crop? (Plea circle the number of the most accurate answer(s) for each crop produced).

TOMATOES
1. Colorado potato beetles
2. Fruit flies
3. Flea beetles
4. Aphids
5. Mites
6. Tomato fruitworms
7. Hornworms
8. Cutworms
9. None
10. Other: _____

BEANS
1. Bean leaf beetles
2. Mexican bean beetles
3. Spotted cucumber beetles
4. Aphids
5. Mites
6. European corn borers
7. Corn earworms
8. Grasshoppers
9. None
10. Other: _____

CUCURBITS
1. Cucumber beetles
2. Pickleworms and/or melonworms
3. Squash bugs
4. Aphids
5. Mites
6. Squash vine borers
7. None
8. Other: _____

C. What **DISEASE(S)** caused the greatest money loss to your 1992 tomato, fresh market bean, or cucurbit crop? (Pleas circle the number of the most accurate answer(s) for each crop produced).

TOMATOES
1. Seedling diseases and damping off
2. Root and stem rots
3. Vascular wilts
4. Leaf spots and blights
5. Fruit rots and post-harvest rots
6. Viral diseases
7. Nematodes
8. None
9. Other: _____

BEANS
1. Seedling diseases and damping off
2. Root and stem rots
3. Anthracnose and Grey mold
4. Bacterial blights
5. White mold
6. Rust
7. Mosaic virus diseases
8. Nematodes
9. None
10. Other: _____

CUCURBITS
1. Seedling diseases and damping off
2. Root and stem rots
3. Anthracnose
4. Leaf spots and blights
5. Vascular wilts (e.g., bacterial, Fusarium)
6. Gummy stem blight
7. Downy and Powdery mildew
8. Viral diseases
9. Nematodes
10. None
11. Other: _____

)ear Producer:

'he United States Department of Agriculture (through its National Agricultural Pesticide Impact Assessment Program) has equested that the University of Missouri provide pesticide usage information on potato production in Missouri. Recent evelopments regarding pesticides in ground water, residues in food, endangered species, and the acceleration of the EPA eregistration program have placed increased pressure on agricultural production systems. **It is important that we have ccurate and current information to support their continued registration and use, and that we document their conomic necessity to potato production in Missouri.**

n order to collect this information, we need your cooperation in completing this survey. **Your response is completely oluntary and confidential; it is not required by law.** This information will be used to develop summaries of regional and tatewide pesticide usage in crop production. We can then provide statistical documentation to administrators and legislators f the importance of pesticides to Missouri's agricultural producers. We appreciate your valuable time and cooperation.

Integrated Pest Management, University of Missouri
Statistical Reporting Service, USDA

*****A REMINDER NOTICE WILL BE SENT APPROXIMATELY 1 WEEK AFTER YOU RECEIVE THIS SURVEY. WE SINCERELY APPRECIATE YOUR ASSISTANCE*****

(ROP ACREAGE

)r all the acreage in your operation in 1992 (including rented land), please complete the following table for the number of lose acres treated **at least once** with an insecticide, herbicide, or fungicide.

	Acres Planted	Ave. Yield (lbs./acre)	Number of Acres Treated with:		
			Insecticides	Herbicides	Fungicides
'otatoes					

PESTICIDES USED ON POTATOES

From the list of pesticides registered for use on potatoes, find those that you applied at least once to the crop or cro acreage. For each pesticide used, please write down the pesticide number, the number of acres you treated with tha pesticide, the number of times you applied that pesticide to the listed acres, and the rate applied.

Pesticide number	Acres treated	Number of times applied	Rate applied

MAJOR POTATO PESTS

A. What **WEED** class caused the greatest money loss to your 1992 potato crop? (Please circle number)

1. Broadleaf Annuals
2. Annual Grasses
3. Perennials
4. None

B. What **INSECT(S)** caused the greatest money loss to your 1992 potato crop? (Please circle number)

1. Colorado potato beetles
2. Potato leafhoppers
3. Flea beetles
4. Cutworms
5. Wireworms
6. Aphids
7. None
8. Other: _____

C. What **DISEASE(S)** caused the greatest money loss to your 1992 potato crop? (Please circle number)

1. Seedling diseases and seed-piece decay
2. Vascular wilts (e.g., bacterial, Verticillium)
3. Foliar diseases (e.g., early and late blight)
4. Bacterial diseases (e.g., soft rot, black rot)
5. Viral diseases and purple-top wilt (aster yellows)
6. Tuber diseases (e.g., black scurf, scab, ring rot)
7. Nematodes
8. None
9. Other: _____

PESTICIDES REGISTERED FOR USE ON POTATOES

INSECTICIDES		Rate / acre
100.	Ambush 2EC	3.2-12.8 fl. oz.
101.	Ambush 25WP	3.2-12.8 oz.
102.	Asana XL	2.9-9.6 fl. oz.
103.	Biobit FC	0.5-7.0 pt.
104.	Biobit WP	0.25-4.0 lb.
105.	Cygon 400	0.5-1.0 pt.
106.	Cythion 57%EC	1.5-2.5 pt.
107.	Diazinon 14G	14-28 lb.
108.	Diazinon 50WP	0.5-1.0 lb.
109.	Diazinon AG500	0.5-1.0 pt.
110.	Dipel ES	1-4 pt.
111.	Dipel 2X	0.5-2.0 lb.
112.	Dipel 4L	0.5-4.0 pt.
113.	Di-Syston 15G	20.0-26.7 lb.
114.	Di-Syston 8	0.375-3.0 pt.
115.	Dyfonate 4EC	2-4 qt.
116.	Dyfonate II 10G	20-40 lb.
117.	Furadan 4F	1-2 pt.
118.	Guthion 2S, 2L	1.5-3.0 pt.
119.	Guthion 3F	1-2 pt.
120.	Guthion 35%WP	1.06-2.12 lb.
121.	Guthion 50%WP	0.75-1.5 lb.
122.	Imidan 50WP	2 lb.
123.	Javelin WG	0.25-1.5 lb.
124.	Lannate 90	0.5-1.0 lb.
125.	Lannate L	2-4 pt.
126.	Lannate LV	1.5-3.0 pt.
127.	Malathion 57%EL, 5EC	1.5-2.5 pt.
128.	Methyl Parathion 4E	3 pt.
129.	Methyl Parathion 6E	2 pt.
130.	Methyl Parathion (7.5 lb./gal.)	0.25-1.5 pt.
131.	Methyl Parathion 2 Thiodan 3EC	1.0-1.33 qt.
132.	Mocap 10%	40-120 lb.
133.	Mocap EC	2.66-8.0 qt.
134.	M-One (Bt)	1.5-4.0 qt.
135.	Monitor 4 Spray	1.5-2.0 pt.
136.	Penncap-M	2-6 pt.
137.	Phosdrin 4EC	0.25-0.5 pt.
138.	Pounce WSB	0.1-0.2 lb.
139.	Pounce 3.2EC	4-8 fl. oz.
140.	Pounce 25WP	6.4-12.8 oz.
141.	Sevin XLR Plus	0.5-2.0 qt.
142.	Sevin 80S	0.66-2.5 lb.
143.	Sevin 50W	1-4 lb.
144.	Sevin 4F	0.5-2.0 qt.
145.	Thimet 15G	15-23 oz./1000 ft. row
146.	Thimet 20G	11.3-17.3 oz./1000 ft. row
147.	Thiodan 2 CO EC	1-2 qt.
148.	Thiodan 3EC	0.66-1.33 qt.
149.	Thiodan 50WP	1-2 lb.
150.	Trident II	1.5-2.0 qt.
151.	Vydate L (broadcast)	2-4 gal.
152.	Vydate L (foliar)	1-4 pt.
153.	Other (please list with rate)	

FUMIGANTS		Rate / acre
50.	Telone C-17	10.3-17.1 gal.
51.	Telone II	9-18 gal.
52.	Other (please list with rate)	

HERBICIDES		Rate / acre
200.	Dacthal W75	6-14 lb.
201.	Diquat H/A	1 pt.
202.	Dual 8E	1.5-3.0 pt.
203.	Dual 25G	6-12 lb.
204.	Eptam 7E	3.5-7.0 pt.
205.	Eptam 10G	30-60 lb.
206.	Gramoxone Extra	1.5 pt.
207.	Lexone 4L	0.33-2.0 pt.
208.	Lexone DF	0.5-1.33 lb.
209.	Linex L	1.0-4.0 pt.
210.	Linex DF	1.0-4.0 lb.
211.	Lorox L	1.0-4.0 pt.
212.	Lorox DF	1.0-4.0 lb.
213.	Poast	0.5-1.5 pt.
214.	Prowl	1.0-3.0 pt.
215.	Prowl 3.3EC	1.2-3.6 pt.
216.	Roundup	2-3 qt.
217.	Secor 4	0.33-2.0 pt.
218.	Sencor DF	0.33-1.33 lb.
219.	Treflan TR-10	5-10 lb.
220.	Treflan EC, MTF	1.0-2.0 pt.
221.	Treflan 5	0.8-1.6 pt.
222.	Treflan 80DC	10-20 oz.
223.	TRI-4	1.0-1.5 pt.
224.	Turbo 8EC	1.5-4.0 pt.
225.	Other (please list with rate)	

FUNGICIDES		Rate / acre
300.	Bravo 500	1.0-2.125 pt.
301.	Bravo 720 (6F)	0.75-1.5 pt.
302.	Bravo 90DG	0.625-1.25 lb.
303.	Bravo W-75	1.0-1.5 lb.
304.	Dithane DF	0.8-2.0 lb.
305.	Dithane M-45 (80WP)	0.8-2.0 lb.
306.	Dithane F-45	0.8-1.6 qt.
307.	Dyrene 50WP	2-5 lb.
308.	Maneb 80	1.5-2.0 lb.
309.	Maneb Plus Zinc F4	2.5-3.25 pt.
310.	Manzate 200 DF	0.8-2.0 lb.
311.	Mertect 340-F	2.5 pt./100 gal.
312.	Penncozeb	1-2 lb.
313.	Penncozeb DF (75DG)	1-2 lb.
314.	Ridomil MZ-58	1.5-2.0 lb.
315.	Ridomil/Bravo 81W	1.5-2.0 lb.
316.	Rovral 4F	2 pt.
317.	Rovral 50WP	1-2 lb.
318.	Other (please list with rate)	

SEED PIECE TREATMENTS		Rate
400.	Manzate 200 DF	2.5 lb./100 gal.
401.	Penncozeb	1.25 lb./50 gal.
402.	Penncozeb DF (75DG)	1.25 lb./50 gal.
403.	Other (please list with rate)	

RATES ARE LISTED ON A "PER ACRE" BASIS UNLESS OTHERWISE INDICATED. FOR BAND TREATMENTS, PLEASE REDUCE AMOUNTS ACCORDING TO THE PORTION OF ACRE TREATED.

Dear Nursery Producer:

The United States Department of Agriculture (through its National Agricultural Pesticide Impact Assessment Program) has requested that the University of Missouri provide pesticide information on nursery production in Missouri. Recent developments regarding pesticides in ground water, residues in food, endangered species, and the acceleration of the EPA re-registration program have placed increased pressure on agricultural production systems. **It is important that we have accurate and current pesticide information to support their continued registration and use, and that we document their economic necessity to agriculture and nursery production in Missouri.**

In order to collect this information, we need your cooperation in completing this survey. **Your response is completely voluntary and confidential; it is not required by law.** This information will be used to develop summaries of regional and statewide pesticide usage in nursery production. We can then provide statistical documentation to administrators and legislators of the importance of pesticides to Missouri's agricultural producers. We appreciate your valuable time and cooperation.

Integrated Pest Management, University of Missouri
Statistical Reporting Service, USDA

*****A REMINDER NOTICE WILL BE SENT APPROXIMATELY 1 WEEK AFTER YOU RECEIVE THIS SURVEY. WE SINCERELY APPRECIATE YOUR ASSISTANCE*****

I. NURSERY (FIELD OR CONTAINER) PRODUCTION.

For your entire nursery operation (including rented land or space), please list the total acres in production, the number of plants produced for sale, and the acres treated with pesticides and growth regulators **during 1992 only**.

Acres In Production	Number of plants Produced for sale	Number of Acres Treated with:			
		Herbicides	Insecticides	Fungicides	Growth Regulators

II. PESTICIDES USED IN NURSERY PRODUCTION.

From the list of pesticides registered for nursery use, find those that you applied to your production area. For each pesticid used, please write out the corresponding number, indicate the production area (in acres) that you treated with the pesticide the number of times you applied that pesticide, the application rate, and whether the formulation was dry or liquid.

Pesticide/Growth Regulator Number (See List)	Number of Acres Treated	Number of Times Applied	Rate of Application (if known)	Formulation 1=Dry 2=Liquid

III. MAJOR NURSERY PESTS (circle or write in one pest).

A. What **INSECT** caused the greatest money loss in your 1992 nursery operation? (If none, write NONE.)

1. APHIDS
2. CATERPILLARS
3. SCALES
4. SPIDER MITES
5. BEETLES
6. OTHER _____

B. What **TYPE of WEED** caused the greatest money loss in your 1992 nursery operation? (If none, write NONE.)

1. GRASS
2. BROAD LEAF
3. WOODY SPECIES
4. PERENNIALS
5. OTHER _____

C. What **DISEASE** caused the greatest money loss in your 1992 nursery operation? (If none, write NONE.)

1. LEAF SPOTS & BLIGHTS
2. RUSTS & MILDEWS
3. DAMPING OFF, CROWN & ROOT ROTS
4. BACTERIAL DISEASES
5. VIRUS DISEASES
6. GALLS & CANKERS
7. CHEMICAL PHYTOTOXICITY
8. OTHER _____

HERBICIDES

H1. 2,4-D, 2,4-DB, 2,4-DP
H2. AAtrex, Atrazine
H3. Accent
H4. Access
H5. Acclaim, Whip, Option
H6. Alanap
H7. Ally
H8. Amiben
H9. Amitrole, Amizol, Weedazol
H10. Ammate
H11. Antor
H12. Aquathol, Hydrothal
H13. Aquazine, Princep, Caliber, Simazine
H14. Arsenal, Chopper
H15. Assert
H16. Assure
H17. Asulox
H18. Avadex, Fargo
H19. Avenge
H20. Balan, Balfin
H21. Banvel
H22. Basagran
H23. Basapon
H24. Betanal
H25. Betanex
H26. Betasan, Prefar
H27. Bicep
H28. Bladex
H29. Blazer, Tackle
H30. Bolero
H31. Bromex, Maloran
H32. Brominil
H33. Buctril
H34. Bullet
H35. Calar, CAMA
H36. Canopy
H37. Caparol
H38. Carbyne
H39. Casoron, Norosac
H40. Chem Hoe, IPC
H41. Classic
H42. Cobra
H43. Command
H44. Cotoran
H45. Curtail
H46. Cycle
H47. Dacthal
H48. Defol
H49. DeVine
H50. Devrinol
H51. Dimension
H52. Diquat
H53. Diuron
H54. Dowpon, Dowpon M
H55. DSMA
H56. Dual, Pennant
H57. Embark
H58. Enide, Dymid
H59. Eptam, Genep
H60. Enquik
H61. Eradicane
H62. Eraser
H63. Evik
H64. Evital, Solicam, Zorial
H65. Express
H66. Extrazine
H67. Fargo, Showdown
H68. Fenac
H69. Ferric Sulfate
H70. Furloe, Chloro IPC
H71. Freedom
H72. Fusilade
H73. Galaxy
H74. Gallery
H75. Garlon
H76. Grazon
H77. Gemini
H78 Genate, Sutan
H79. Glean, Telar
H80. Goal
H81. Gramoxone, Starfire
H82. Graslan, Spike
H83. Harmony Extra
H84. Hoelon, Illoxan
H85. Hyvar
H86. Ignite
H87. Igran
H88. Karmex
H89. Kerb
H90. Krenite
H91. Krovar
H92. Laddok, Prompt
H93. Landmaster BW or II
H94. Lariat
H95. Lasso, Judge, Partner
H96. Lexone, Sencor
H97. Londax
H98. Lorox
H99. Marksman
H100. MCPA, Weed-Rhap
H101. MCPB, Can-Trol, Thistol
H102. MCPP
H103. Milogard
H104. Modown
H105. MSMA
H106. Nortron, Prograss
H107. Ordram
H108. Oust
H109. Paarlan
H110. Phytar, Rad-E-Cate
H111. Pinnacle
H112. Poast, Vantage
H113. Pramitol
H114. Preview
H115. Probe
H116. Prowl, Stomp
H117. Pursuit
H118. Pyramin
H119. Ramrod
H120. Redeem
H121. Reflex
H122. Ro Neet
H123. Rodeo, Roundup
H124. Ronstar
H125. Salute
H126. Scepter, Image
H127. Sharpshooter
H128. Sinbar
H129. Sodium Chlorate
H130. Sonalan, Curbit
H131. Sonar
H132. Spin-Aid
H133. Squadron
H134. Stam, Stampede, Wham
H135. Stinger, Lontrel, Reclaim
H136. Storm
H137. Sulfuric Acid, N-Tac
H138. Surflan
H139. Sutan +
H140. Sutazine
H141. Tackle Plus
H142. Tamden
H143. TCA
H144. Team
H145. Tenoran
H146. TIller
H147. Tilliam
H148. Tordon
H149. Touchdown
H150. Treflan
H151. Tupersan
H152. Vapam
H153. Velpar
H154. Vernam, Reward
H155. Weedmaster
H156. Other Herbicide(s) - (please list)

_____

INSECTICIDES

I1. Abate
I2. Acaraben
I3 Actellic
I4. Affirm, Avid, Agri-Mek, Zephyr
I5. Ambush, Atroban, Ectiban, Pounce, Pramex
I6. Amdro, Max Force
I7. Ammo, Demon, Cymbush, Cynoff
I8. Apex
I9. Apollo
I10. Asana
I11. Award
I12. Azatin, Margosan-O
I13. Baam, Mitac
I14. Basamid
I15. Baygon
I16. Bathroid, Tempo, Decathlon
I17. Baytex
I18. Bidrin
I19. Blackleaf 40, Nicotine Sulfate
I20. Bolstar
I21. Calcium Cyanide
I22. Capture, Brigade, Talstar
I23. Carzol
I24. Counter
I25. Cryolite, Kyrocide
I26. Curacron
I27. Cygon, Defend, Rebelate
I28. Danitol
I29. Deadline, Metaldehyde
I30. Deltic
I31. Diazinon, Knox Out, D-z-n
I32. Dibrom
I33. Dimilin
I34. Di-Syston
I35. Dursban, Lorsban, Pagent
I36. Dyfonate, Crusade
I37. Dylox, Dipterex, Prolox
I38. Elgetol
I39. Enstar
I40. Ethion
I41. Force
I42. Fumi-Cel
I43. Furadan
I44. Guthion, Azinphos M
I45. Imidan
I46. Karate, Commodore
I47. Karathane
I48. Kelthane
I49. Kryocide, Cryolite
I50. Lannate, Nudrin
I51. Larvadex, Trigard, Citation
I52. Larvin
I53. Lindane, Gamma-Mean
I54. Logic, Torus, Award
I55. Malathion, Cythion
I56. Matacil
I57. Mavrik, Spur
I58. Mesurol, Grandslam
I59. Meta Systox R
I60. Methyl Bromide
I61. Methoxychlor
I62. Mitac, Taktic
I63. Monitor
I64. Mocap
I65. Morestan, Joust
I66. Natur-Gro Triple Plus
I67. Nemacur
I68. Nexion
I69. Omite, Comite, Ornamite
I70. Oftanol, Amaze, Pryfon, Discus
I71. Orthene
I72. Pay Off, Cybolt
I73. Parathion (Ethyl), Ethyl Parathion
I74. Parathion (Methyl), Methyl Parathion
I75. Pentac
I76. Pestroy
I77. Phosdrin
I78. Phosphamidon, Swat
I79. Phostoxin, Fumitoxin
I80. Plictran
I81. Pydrin, Pyrid
I82. Pyrellin
I83. Pyrenone
I84. Pyrethrin
I85. Reldan
I86. Rotenone, Rotacide
I87. Ryana
I88. Safrotin
I89. Safer, M-Pede, Insecticidal Soap
I90. Saf-T-Side, Sunspray, Volck, Dormant & Summer Oils
I91. SBP1382, Scourge, Derringer
I92. Scout
I93. Sevin, Sevimol, Carbaryl
I94. Sumithion
I95. Supracide
I96. Talstar, Capture, Brigade
I97. Tame, Sumithrin
I98. Tedion
I99. Telone II
I100. Telone C-17
I101. Temik
I102. Tetralate
I103. Thimet
I104. Thiodan, Endosulfan
I105. Timbor
I106. Trithion
I107. Turcam, Ficam, Rotate, Dycarb
I108. Vapam, Soil Prep, Sectagon II
I109. Vapona, DDVP
I110. Vendex
I111. Veratran D, Sabadilla
I112. Vorlex
I113. Vydate
I114. Zectran
I115. Zolone
I116. Bactimos, Teknar, Vecobac, Acrobe, Skeetal
I117. Bio Safe, Biovector
I118. Condor
I119. Cutlass
I120. Clandosan
I121. Diatomaceous Earth, Celtom, Celite
I122. Dipel, Thuricide, Biobit, Foray, MVP, Javelin
I123. Elcar
I124. Entice
I125. Foil
I126. Good Bug Power Meal
I127. Checkmate
I128. Isomate
I129. Konsume
I130. M-One, M-Trak
I131. Pred Feed
I132. Stirrup M
I133. Trident
I134. Exhibit
I135. Parasitic wasps
I136. Predatory mites
I137. Other Biological Agents
I138. Other Insecticide(s) - (please list)

_____

_____

FUNGICIDES

F1. Acti Done
F2. Agri-strep, Agrimycin
F3. Alamo
F4. Aliette
F5. Apron, Ridomil, Subdue
F6. Arasan
F7. Arbortect, Mertect
F8. Banner
F9. Banol, Prevex
F10. Banrot
F11. Tri Basic, Cuproxat
F12. Bayleton
F13. Baytan
F14. Beam, Bim
F15. Benlate, Tersan
F16. Biab-T, F-Stop
F17. Blue Shield
F18. Bordeaux Mix
F19. Botran
F20. Bravo
F21. Broadway
F22. Busan 30 & 72
F23. Cadminate
F24. Captan
F25. Carbamate
F26. Carbocop, Nutra-Spray, Malachite
F27. Chipco 26019
F28. Cleary 3336
F29. COS
F30. COCS
F31. Complex
F32. Copper Count N, K-Cop
F33. Cupric Zinc Sulfate Complex
F34. Curalan
F35. Cyprex
F36. Daconil 2787
F37. Dagger-G
F38. Demosan, Terraneb
F39. Difolatan
F40. Dikar
F41. Dithane A40 & D14
F42. Dithane M-22
F43. Dithane M45, Manzate 200, Fore, Penncozeb
F44. Dithane Z-78
F45. Domain
F46. Du Ter
F47. Dyrene
F48. Elgetol
F49. EPIC
F50. Ferbam
F51. Fungaflor
F52. Funginex
F53. Fungo
F54. Gallex
F55. Galltrol A
F56. Glyodin
F57. Isobac, Nabac
F58. Kocide
F59. Kocide 404S
F60. Karathane
F61. Lime Sulfur
F62. Maneb
F63. Mertect
F64. Milban
F65. MP 11
F66. Myco Shield
F67. Nordox
F68. Nova
F69. OPP
F70. Orbit
F71. Ornalin, Ronilan
F72. Pace
F73. Phaltan
F74. Phytan 27
F75. Pipron
F76. Plantvax
F77. Pro-Gro
F78. Polyram
F79. Quintar
F80. Rally
F81. Ridomil Bravo
F82. Ridomil MZ-58
F83. Ridomil PC
F84. Rovral
F85. Rubigan
F86. Sentinal
F87. SOPP
F88. Stop Scald
F89. Sulfur
F90. Syllit
F91. Tenn-Cop, Citcop
F92. Terrazole, Truban
F93. Terraclor, F60, Turfcide
F94. Terramycin
F95. Terraneb
F96. Tilt
F97. Top-Cop
F98. Topsin-M
F99. Vapam
F100. Vitavax
F101. Zineb
F102. Ziram
F103. Zyban
F104. Other Fungicide(s) - (please list)

_____

GROWTH REGULATORS

G1. A Rest
G2. Accel
G3. Atrinal, Atrimmec
G4. B Nine
G5. Bonzi, Clipper
G7. Cutlass
G8. Cycocel
G9. Embark, Trim-Cut
G10. Event
G11. Florel, Ethrel
G12. Gibberellic Acid
G13. Hormodin, Rootone
G14. K-Salt
G15. Limit
G16. Liquid-Stik, Olive-Stop
G17. Maintain
G18. MH 30, Gro Slo
G19. Off Shoot O
G20. Pinolene, Vaporguard, Wilt Pruf
G21. Po-San
G22. Promalin
G23. Pro Shear
G24. Rootone F
G25. Short Stop
G26. Stik
G27. Sumagic
G28. Thin n Stop Drop
G29. TGR (Poa Annua Control)
G30. Tre Hold
G31. Other Growth Regulator(s) - (please list)

_____

IV. ALTERNATIVE CONTROLS.

A. If the **PESTICIDES** you use in your nursery operation were cancelled, **check** one or more of the following alternative you would switch to and the estimated change in plant production (output, volume/quality) and costs by using th alternative(s). **(For example: If you had to switch to another insecticide that decreases your production by 8% and costs 15% more, then you would check <10% decrease in plant production and 10-25% increase i production costs.)**

1. Insecticides

	Change in Plant Production (Output/Quality)				
	None	<10% Decrease	10-25% Decrease	26-50% Decrease	>50% Decrease
a. Another insecticide					
b. Cultural control					
c. Beneficial insects					
d. Other (please list)					

	Change in Production Costs				
	None	<10% Increase	10-25% Increase	26-50% Increase	>50% Increase
e. Another insecticide					
f. Cultural control					
g. Beneficial insects					
h. Other (please list)					

. Herbicides

	Change in Plant Production (Output/Quality)				
	None	<10% Decrease	10-25% Decrease	26-50% Decrease	>50% Decrease
a. Another herbicide					
b. Rotation					
c. Mowing					
d. None					
e. Other (please list)					

	Change in Production Costs				
	None	<10% Increase	10-25% Increase	26-50% Increase	>50% Increase
. Another herbicide					
g. Rotation					
n. Mowing					
. None					
. Other (please list)					

3. Fungicides

	Change in Plant Production (Output/Quality)				
	None	<10% Decrease	10-25% Decrease	26-50% Decrease	>50% Decrease
a. Another fungicide					
b. Resistant variety					
c. Improved sanitation					
d. None					
e. Other (please list)					

	Change in Production Costs				
	None	<10% Increase	10-25% Increase	26-50% Increase	>50% Increase
f. Another fungicide					
g. Resistant variety					
h. Improved sanitation					
i. None					
j. Other (please list)					